ROGERSVILLE, ALABAMA

WASTEWATER FACILITIES PLAN

Prepared for the

Rogersville Water and Sewer Board

Rogersville City Council

Rogersville Planning Commission

Prepared by:

Northwest Alabama Council of Local Governments

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1.0 Executive Summary

1.0 EXECUTIVE SUMMARY

The purpose of this document is to examine the condition and demand for wastewater treatment facilities in the Town of Rogersville, Alabama and the surrounding territory (i.e. the "study area", see Map 3.1) over the next 20 years. The study considers trends in population, housing, economy, land use, and existing sanitary sewer conditions to determine the existing and potential demand for rehabilitation and extension of wastewater treatment facilities. Given this information, an assessment is made of alternative methods of disposal including estimates of cost and environmental impact associated with the use of various treatment alternatives. The study also explores possibilities for potential interconnectivity between existing and proposed systems. Final recommendations regarding suggested alternatives and potential funding sources are included.

The first step in the analysis was the determination of potential demand for wastewater treatment. The estimates are measured in flow rates--gallons per day (gpd) and gallons per hour (gph) during peak flow times. These estimates were calculated from an analysis of trends in a) population growth b) changes in economic sectors (industrial and commercial) and c) land use characteristics of existing development. These estimated growth rates were then applied to estimates of average flow rates for residential units, commercial and industrial uses. Assuming similar growth trends, the Town of Rogersville will see an increase in demand for wastewater treatment in the next 20 years, due primarily to growth in population in areas adjacent to the current town limits and growth in demand for single family land use.

Currently, the system serves 670 customers, with no major commercial customers and one industrial connection. No additional capacity will be required to meet projected demand for residents in the currently incorporated areas of Rogersville, assuming no additional annexation occurs. If, as is likely, expansion of services outside of the corporate limits or annexation occurs, then facilities will be inadequate, and growth will precipitate the need for additional facilities. Estimates of this demand vary widely to an extent directly related to population and economic growth and development. The models that follow assume that extensions will occur within the high-growth urban fringe and that these extensions will be made available to serve all potential customers within this area. To meet increased capacity demands, two alternative collection and two alternative treatment methods were explored. First, collection methods included gravity flow and low-pressure sewer systems. Due to factors of cost and environmental concerns, gravity flow sewer collection was selected as the recommended alternative, where possible. Second, alternative treatment methods were reviewed. The two alternatives reviewed were the expansion of existing lagoon system and the installation of a package plant to expand treatment capacity.

Based on the findings of this study, it is likely that the Town of Rogersville will see an increased demand for wastewater treatment capacity in the next 20 years. Increased demand will probably result primarily from increases in residential land use and population growth in territory presently adjacent to the Town limits. Demand in these areas is expected to grow and outpace the Town's ability to adequately supply all potential customers. An annexation and growth strategy will be required to maintain adequate service levels. As demand grows and additional facilities become necessary, the most economical and environmentally sensible solution to the problem of meeting this demand is the expansion of the existing lagoon system due to its lower projected costs, initially and in operation. Potential sources of funding include Community Development Block Grant program funds, the Appalachian Regional Commission and Economic Development Administration for system treatment expansion. Primary responsibility for collection system expansion will fall to private parties in the process of land development. Gravity sewer extension is the preferred collection method of the Water and Sewer Board; however, the extension of low pressure collection may be considered under certain circumstances. The extension of services through the Town as growth occurs will be one of the primary challenges faced by the citizens and officials of Rogersville in the coming years.

2.0 General Scope of Work

2.0 GENERAL SCOPE OF THE WORK

This document synthesizes analysis of population, economics, land use and existing wastewater treatment capacity and usage for the Town of Rogersville, Alabama in order to produce projections of the need for improvements to wastewater facilities in the Town and the surrounding unincorporated areas of east Lauderdale County in approximately the next twenty years. The study is a joint effort, combining the expertise of the Northwest Alabama Council of Local Governments (NACOLG) and Price and Rider Engineering (engineer). NACOLG carried primary responsibility for assembling data and analysis of population, economic, and land use trends, mapping existing conditions and document management. The engineer compiled projections related to existing wastewater capacity, demand for services, and treatment alternatives. This partnership has produced a detailed analysis of the likely scope and shape of demand for wastewater services in Rogersville in the anticipated planning horizon. The study meets the following objectives:

- Evaluate existing condition of wastewater treatment facilities in Rogersville.
- Provide preliminary estimates of 20-year potential sewage flow rates in the study area.
- Provide preliminary estimates of sizes and locations for 20-year potential treatment facilities.
- Evaluate alternative collection, treatment and disposal options.
- Provide preliminary recommendations and cost estimates for the most feasible alternative(s).

This study has also been reviewed and approved jointly by the Rogersville Water and Sewer Board, the Rogersville Planning Commission and the Rogersville City Council. It is endorsed by each as a portion of the Town's overall capital facilities plan, which is itself an important part of the Town's Comprehensive Plan.

3.0 Characteristics of the Study Area

3.0 CHARACTERISTICS OF THE STUDY AREA

This section of the study details the important geographic and political features of the town of Rogersville, which affect wastewater facilities' demand and placement.

3.1 General Information

The Town of Rogersville, Alabama is a community of approximately 1199 residents[1] located in east Lauderdale County, Alabama. The town is located on U.S. Highway 72, approximately 25 miles east of Florence, 20 miles west of Athens and Interstate 65, and 45 miles west of Huntsville. The study area consists of the town and surrounding unincorporated areas likely to demand wastewater treatment services in the future. Map 3.1: Rogersville Location Map and Map 3.2: Rogersville Wastewater Study Area illustrates the location of Rogersville and the extent of the corporate limits and study area. The Town itself is a rural community and has been heavily influenced by an agricultural economy. The unincorporated portions of the study area are likewise rural and agricultural. Rogersville contains approximately 97 commercial parcels, 6 industrial properties, and 511 properties devoted to residential land uses (11 manufactured homes, 495 single-family residences, and 5 multi-family properties). Development patterns inside the Town consist predominantly of dispersed, large-lot housing. Commercial development is dispersed linearly along U.S. Highway 72, with one cluster of 'downtown' commercial development near the intersection of U.S. 72 and Wheeler Road. The unincorporated sections of the study area are similarly rural, low-density, and primarily agricultural and residential. However, the area Wheeler Lake, one of the largest recreational lakes in the state, is increasingly attractive to new development and will likely exert a profound impact on the development of the Town proper and demand for services.

3.2 Climate[2]

The climate at Rogersville is temperate with long summers and mild winters. Rainfall is abundant and generally is well distributed. Monthly precipitation is consistent throughout the year, with an average monthly rainfall of 4.65 inches, relatively sharp increases in March, and decline in rainfall in August. Snows are negligible and inconsistent in the winter months. Severe temperature extremes are rare. Some variation in the extreme ranges, up to a normal high of 90.6° in July and down to a normal low of 30.7° in January, are to be expected. Normal average temperatures range from 80.2° Fahrenheit in July to 39.9° Fahrenheit in January. Summers are marked by warm temperatures and high humidity, beginning in May and continuing into September. In an average summer the temperature reaches or exceeds 90° F on about 67 days, but 100°temperatures occur on only about 4 days. It is not too unusual for the temperature to fail to reach 100°a single time for two or three summers in a row. Cold fronts do not reach the area very often in summer, so that breaks from the heat and humidity are very few. The first cool weather usually arrives late in September or early in October, and the heat and humidity or summer give way to Indian summer and fall. This is by far the most pleasant season of the year. This period lasts from about late September into November. During this time rainfall is lighter, humidity is lower, and the percentage of sunshine is higher than at other times. Also during this time, the chances of extended periods of uninterrupted fair, dry weather are increased. Winters are not severely cold and are relatively short. The temperature drops to freezing or lower on about 57 days, but long term records at nearby Decatur show that lows of zero or below con be expected roughly one winter in nine. The first 32° weather arrives about the first of November. Records at Muscle Shoals, in adjacent Colbert County, show that in the average growing season, the number of days between the last 32° low in spring and the first in fall is 224. Rogersville can expect several days with snow flurries in an average winter, but a snowfall heavy enough to remain on the ground more than 1 or 2 days is unusual. A notable exception was a New Year's Eve snowfall that deposited 19.7 inches in Florence by the morning of January 1, 1964. Of that amount, 19.2 inches fell within 24 hours. This was the most ever recorded in the State of Alabama during a 24-hour period. The mean annual snowfall in Rogersville is slightly less than 3 inches, but the actual amount is highly unpredictable in any given year. Several years in succession with no measurable snowfall may precede a year in which a major snowstorm occurs. Prior to the 1963 storm, a major snowfall occurred in 1960. On the morning of February 13, snow depths ranged from 4 inches in the northwestern part of Lauderdale County to more than 12 inches in the southeastern part. The lowest temperature ever recorded in Lauderdale County was 11° below zero on February 13, 1899, at Florence. It was 9° below zero on February 26, 1940, and 8° below zero on January 31, 1966. It is possible that parts of eastern Lauderdale County were colder than 11° below zero on the morning of January 31, 1966. Although recorded lows in the Muscle Shoals-Florence-Waterloo area were 5° to 8° below zero, it was 17° below at Athens, 19° below at Belle Mina in adjacent Limestone County, and 24° below at Russellville in Franklin County.

Spring is the most changeable and stormy season. In March the days may change quickly from mild to cold and blustery, but by May they usually settle down to a warm, pleasant routine. The chances of damaging windstorms or tornadoes are greater in spring, especially in March and April, than at any other time of the year. However, even in this peak storm season, the probability of any one farm or home being struck is extremely slight. While tornadoes are more commonly associated with spring, they can occur in any month of the year. Generally, the last 32° temperature in spring occurs about the last week of March, but this can vary greatly from year to year.

A drought occurs when there is no water in the soil available to plants. A drought day is a day during which no water is available to plants. The frequency and severity of drought depends on the capacity of the soil to hold available moisture, on the amount and distribution of precipitation, and on the amount of water used or transpired by the plants. Even in a normal year, there are periods when rainfall does not supply the water needs of most crops, and in which supplementary irrigation might be needed for maximum crop production. During a severe drought, however, the supply of water for irrigation may be limited or non-existent. The Rogersville area is subject to a partial drought roughly once or twice every 10 years. Severe droughts are less frequent.

In an average year any one location in Lauderdale County will receive measurable rain (0.01 inch or more) on about 108 days. Eighty days will have 0.10 inch or more, and 34 days will have 0.50 inch or more. Most of the rainfall in the summer falls during thunderstorms, especially in June, July, and August. Thunderstorms occur on about 28 days of that period. One of the most severe droughts on record in the Rogersville area occurred in 1924. At Florence a mere 2.18 inches of rain fell over a span of 119 days, from August 8 to December 4. The normal rainfall for that period is about 13.25 inches. No rain fell during October. It was also very dry in the area in 1954, when most of the rest of Alabama was suffering the most severe drought in history. At Muscle Shoals, during this period, only 3.83 inches fell from June through August, a deficiency of 9.12 inches.

Evapotranspiration is the removal of water from the soil by evaporation and plant transpiration. The rate of evapotranspiration in Rogersville is highest in summer, mainly in June and July. It is lowest in winter.

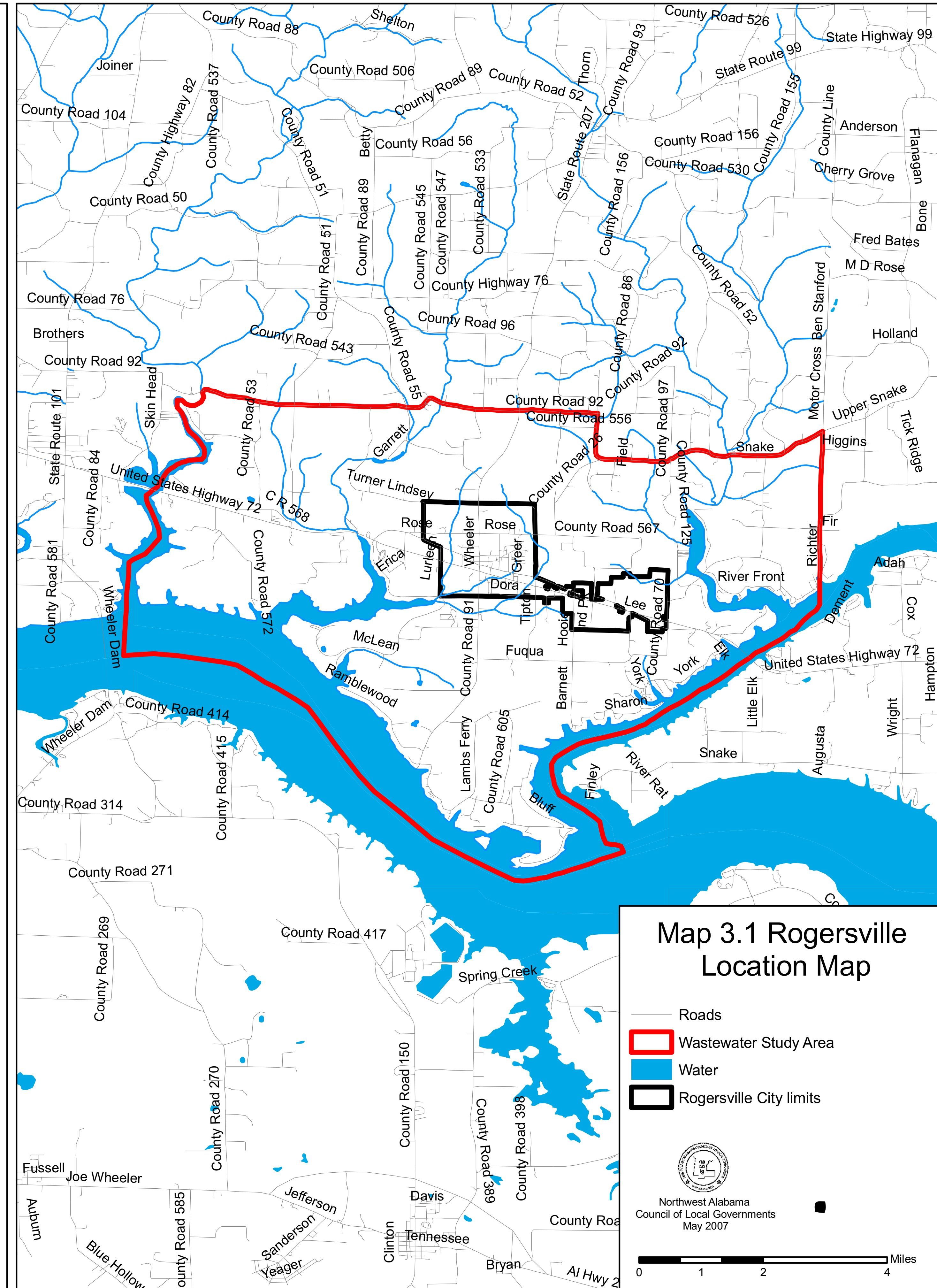
3.3 Topography

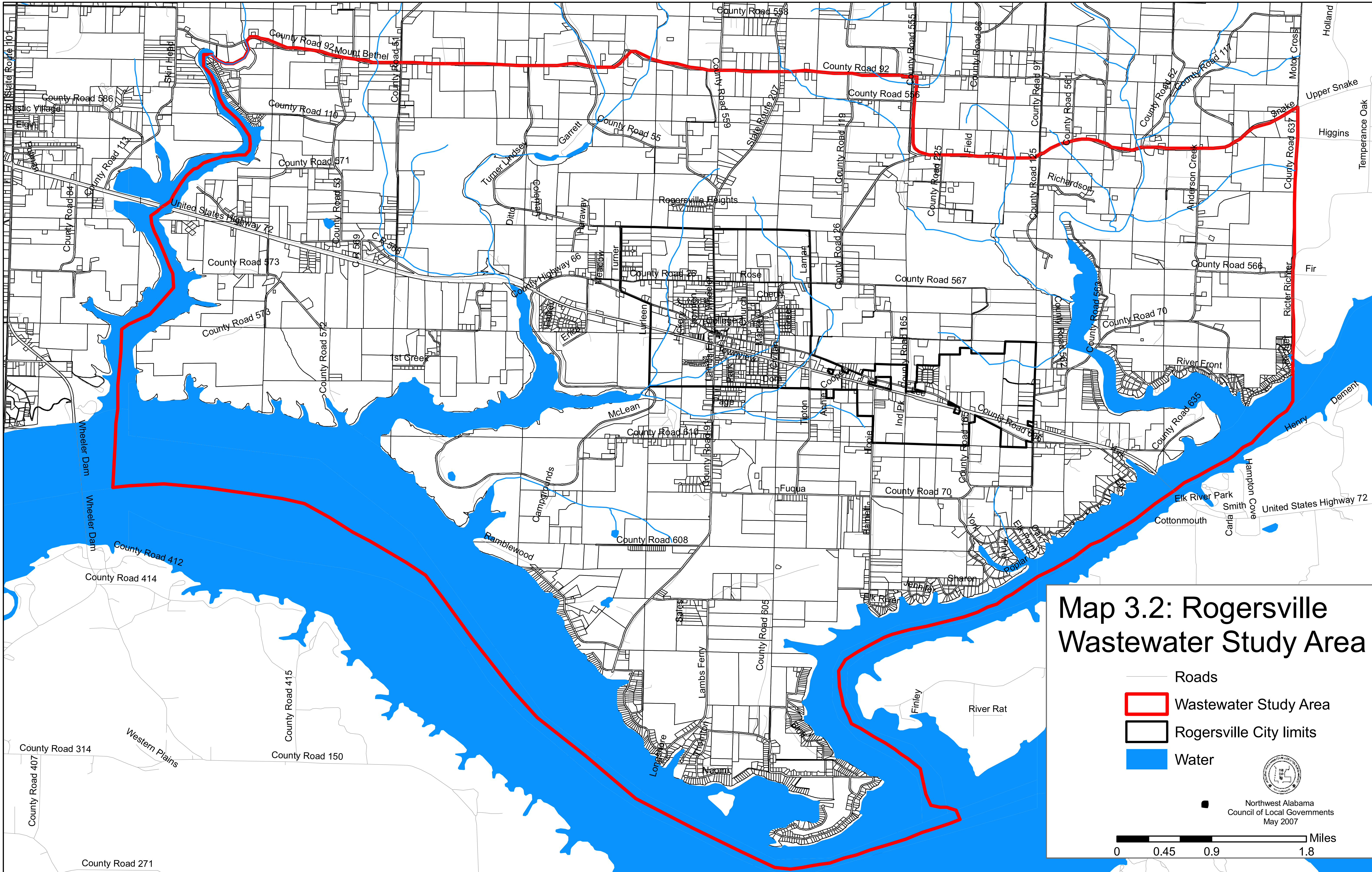
The topography of the study area (see Map 3.3: Rogersville Topography) is flat to moderately sloping with elevations from approximately 720 feet north of Town to about 560 feet above mean sea level at the outlet to major streams and along the Tennessee River. In general, higher elevations to the north/northwest give way to lower elevations to the south/southeast at Wheeler Lake and Elk River. The general slope of the planning area is southwestwardly toward First Creek, but the study area is partitioned into two major drainage basins by a low ridge running generally north/south (See Map 3.4: Rogersville Drainage Basins). The portion of the planning area east of County Road 77 (Barnett Road) slopes eastwardly toward Elk River. The portion of the planning area south of Fuqua Lane (County Road 70) slopes southwardly toward Wheeler Lake. Numerous smaller ridges create basins for various streams and drainage areas.

Slopes within the study area generally do not present hazards or constraints to development. Map 3.5: Rogersville Soil Slopes displays the general terrain features and shows that slopes seldom exceed 10 percent, except in the

State of Alabama

Map 3.1 Rogersville Location Map




Map 3.2: Rogersville Wastewater Study Area
Roads
Wastewater Study Area
Rogersville City limits
Water
Northwest Alabama Council of Local Governments
May 2007
Miles
0
0.45
0.9
1.8
County Road 558
County Road 92
Mount Bethel
County Road 586
Rustic Village
County Road 110
County Road 571
County Road 55
Garrett
County Road 559
State Route 207
County Road 119
County Road 556
County Road 555
County Road 86
County Road 97
County Road 561
County Road 52
County Road 117
Upper Snake
Motor Cross
Holland
Higgins
Temperance Oak
County Road 637
Snake
County Road 225
Field
County Road 125
Richardson
Anderson Creek
Rogersville Heights
United States Highway 72
County Road 573
County Road 113
County Road 84
County Road 53
County Road 569
County Highway 66
County Road 26
County Road 567
County Road 566
Fir
Ricter Richter
County Road 70
River Front
County Road 635
Dement
Henry
Hampton Cove
Elk River Park
Smith
Cottonmouth
Carla
1st Creek
County Road 572
McLean
County Road 610
Fuqua
County Road 608
Ramblewood
Campgrounds
Wheeler Dam
County Road 412
County Road 414
County Road 415
County Road 150
County Road 314
County Road 407
Western Plains
County Road 271
Lambs Ferry
County Road 605
Sharon
Elk River
Poplar
Finley
River Rat
State Route 101
Elgin

areas immediately adjacent to rivers and streams. The topography of most of the planning area is gently to moderately sloped (2%-8%). However, some of the land bordering First Creek, Elk River, and Wheeler Lake is very steeply sloped. This indicates, generally, less need for extensive site preparation and grading in new developments.

3.4 Soils[3]

Soil characteristics such as slope, permeability, and depth establish site conditions and suitability for development. The cost and suitability of a site for the construction of roads, bridges, reservoirs, septic systems, foundations, landscaping, and virtually all man-made improvements are related to soil characteristics. For the purposes of wastewater treatment, the most important features to consider are those affecting treatment alternatives, such as suitability for septic tanks, reservoirs and lagoons, and spray fields.

In the study area, soils fall into three general associations based on the predominant primary and secondary soil types concentrated in the same general location. Although slope plays a large role in determining soil limitations, soils of the same type share similar treatment limitations. From least to most prevalent, the associations found in the study area are Bodine-Fullerton, Dickson-Fullerton, and Dewey-Decatur.

Bodine-Fullerton soils are the least prevalent association in the study area. They are located primarily adjacent to First Creek, Anderson Creek, and the Tennessee River. This association is well-drained to excessively drained, medium textured and sloping to steep (grades of 15 to 35 percent). Both soil types have moderately rapid infiltration and permeation, but have moderate to severe septic and sewage lagoon restrictions due to slope and permeability.

Dickson-Fullerton soils are the second most prevalent association in the study area. They are located primarily in the north-center of the study area. The association is moderately well-drained to well-drained, medium textured, cherty soils that are nearly level to strongly sloping (grades of 2 to 10 percent). In Dickson soils, the predominant soil type of the association, infiltration is moderate, while permeability is moderate above the fragipan but slow in the fragipan. Soils of this type tend toward severe septic limitations and slight sewage lagoon limitations.

Dewey-Decatur soils are the largest association and predominate in the south and southeast of the study area. These soils are well-drained, dominantly medium-textured and non-cherty shoils that are nearly level to strongly sloping (grades of 2 to 10 percent). Infiltration and permeability are moderate, with slight septic limitation and moderate sewage lagoon limitations, depending on slope.

For the purposes of wastewater treatment, the most significant characteristic of soils are their suitability for septic systems. As the primary alternative to centralized sanitary sewers in the study area, a number of different characteristics relating to drainage and absorption create conditions favorable or unfavorable to this alternative.

Soils in the study area vary in terms of suitability for septic systems, with large areas located to the north of Rogersville and intermittent areas, largely adjacent to streams, to the south.

The following table describes the predominant soil series found in the planning area as they relate to the use of onsite sewage disposal systems.

Soil Series and Map Symbol	Degree & Limitation for Septic Tank Field Lines
Dickson - Do B	Severe, slow permeability; seasonal high water table

Dewey - De B	Slight
Bodine - Bo E	Moderate where slopes are 10-15%; severe where slopes are 15-35%
Fullerton - Fa C	Slight of moderate; slope

Map 3.6: Rogersville Soil Septic Limitations illustrates the location of soils unsuitable for septic systems[4]. Approximately 19% of the territory within the wastewater study area suffers from slight to moderate septic restrictions and another 45% are classified as having severe soil septic limitations. While not impossible in areas with severe septic restrictions, traditional septic systems are more expensive in areas shown in red due to the need to remediate drainage and absorption characteristics, requiring greater investment or larger land areas for development. These development conditions, combined with expected population increases, create a demand for wastewater treatment services in and around Rogersville.

3.5 Geology

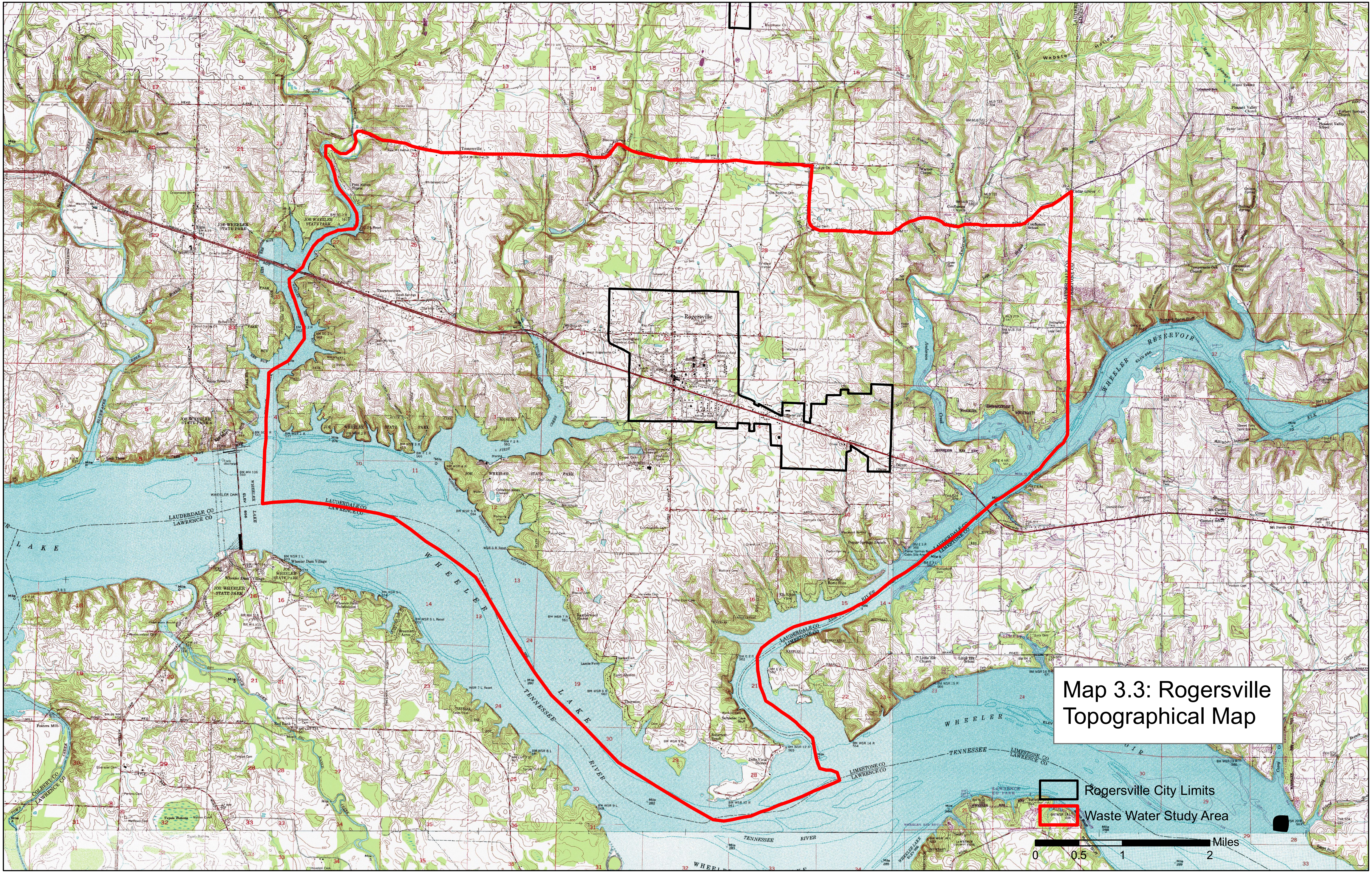
Alabama is divided into five groundwater provinces: the Coastal Plain, Piedmont, Valley and Range, Cumberland Plateau, and Highland Rim. The provinces are defined on the basis of differences in water bearing properties of rocks, rock type, structural geology, and physiography. Such characteristics determine the types of aquifer in these areas. Eighty percent of the public water supply systems in Alabama have at least one groundwater source.

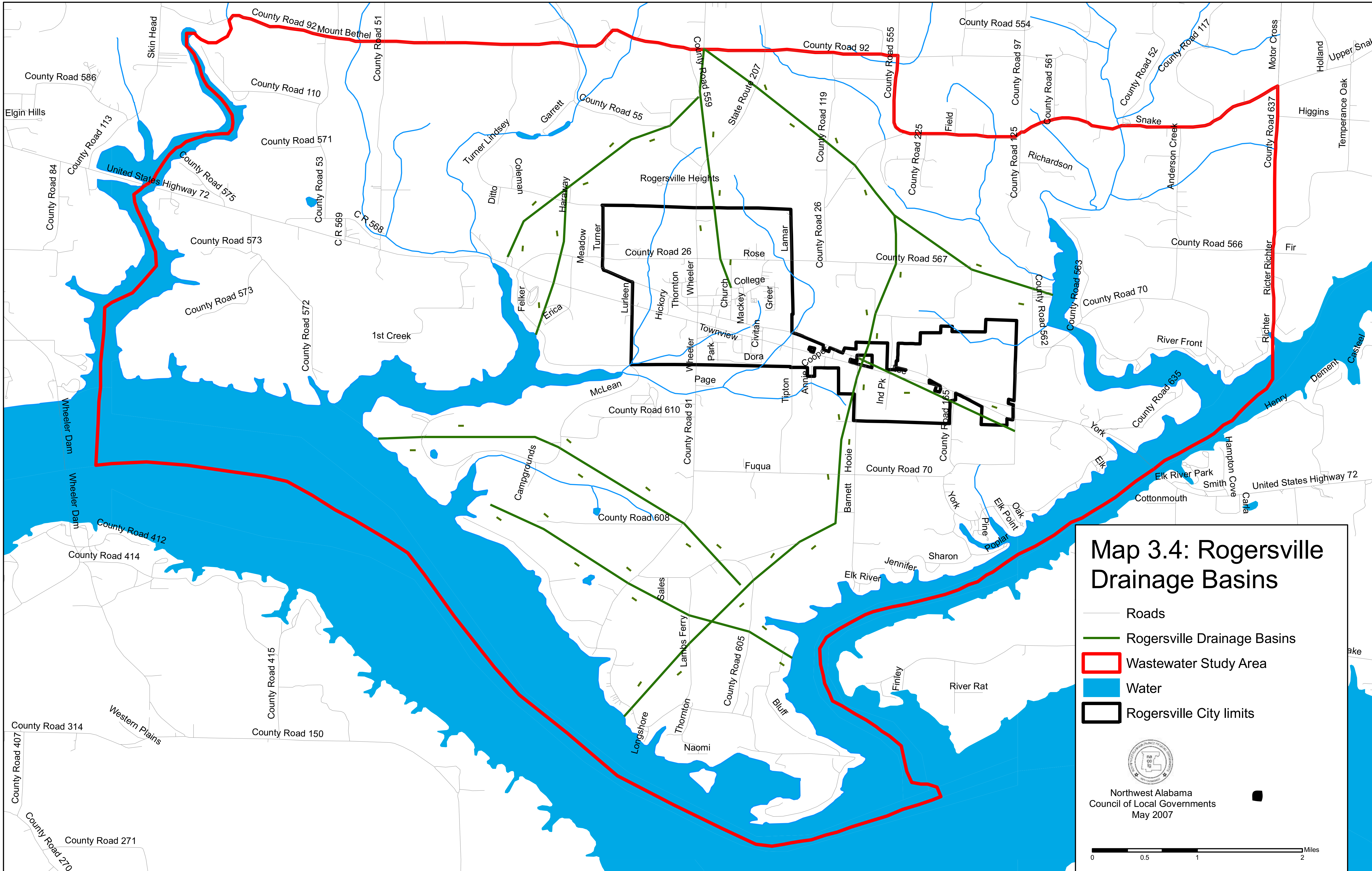
Rogersville and Lauderdale County are located in the Highland Rim province. The Highland Rim is characterized by limestone, dolomite and chert rock units. Dissolution along fractures in the rocks has created a subsurface conduit system of caves, tunnels and channels. Karst features such as sinkholes, springs, and streams that disappear into the ground are common.

3.6 Natural Resources

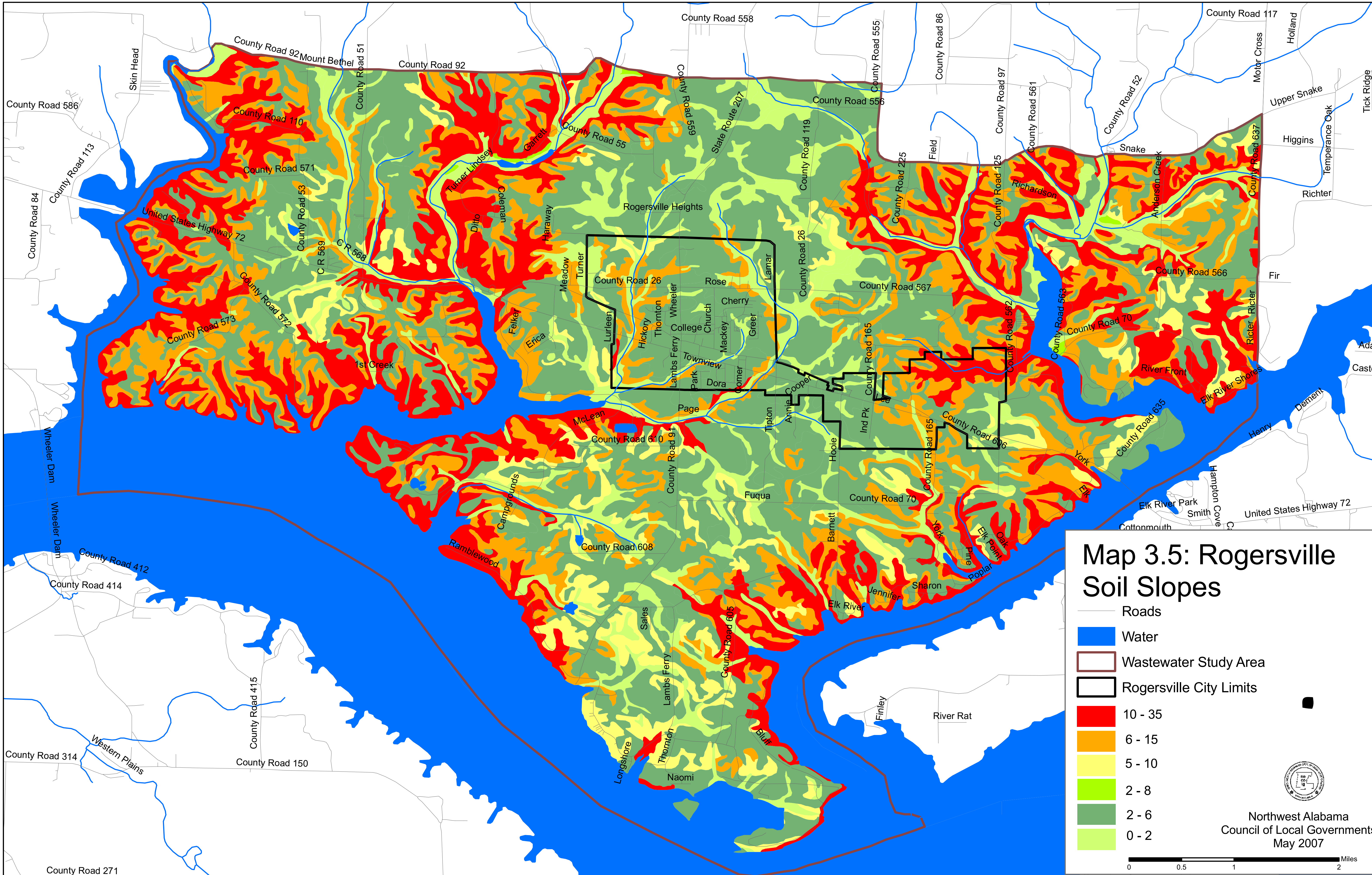
Alabama's rich natural resources for agriculture include a long growing season, plenty of rainfall, and a variety of soils. Alabama is one of the leading lumber-producing states, with almost two-thirds of the state forested. The chief commercial trees are pines; other important woods are oak, gum, and yellow poplar. Valuable industrial resources include rich deposits of coal, iron ore, limestone, bauxite, and white marble. Alabama's long dependence upon cotton led to erosion of the one-crop land and depletion of soil nutrients. Farms have been rebuilt by the use of fertilizer, crop rotation, and other conservation methods. Crop potential in Rogersville and surrounding areas depends largely on soil types, with northern associations being better suited to seed crops and timber. Southern associations are poorly suited for seed crops and only moderately acceptant of hardwood and softwood timber production. Geologic limestone, sandstone and shale give the region some gravel and sand production potential, which is largely unrealized. However, the major natural resource of the region is surface water access via Wheeler Lake, which provides resort fishing, camping and outdoor water sporting opportunities.

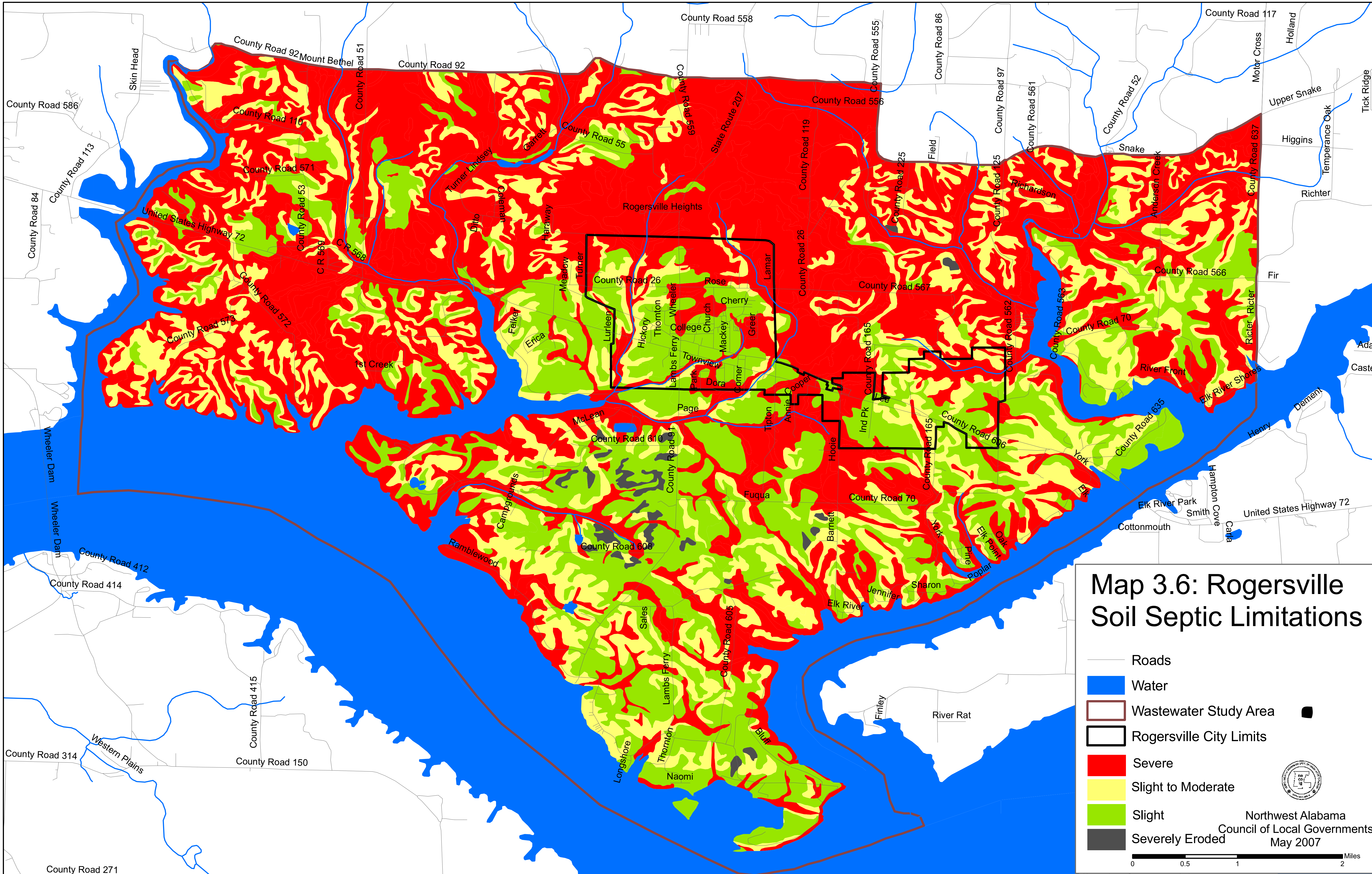
Hydroelectric generators have been installed in many of the dams. A valuable source of waterpower is at Muscle Shoals, near Florence, where the Tennessee River drops about 130 feet (40 meters) in 37 miles (60 kilometers). The Tennessee Valley Authority built Wheeler and Wilson dams on the river. Other projects in the state include Martin Dam, on the Tallapoosa River, and Lewis Smith Dam, on the Sipsey Fork. The Farley nuclear-power


Map 3.3: Rogersville Topographical Map
Rogersville City Limits
Waste Water Study Area
Miles
0
0.5
1
2
Rogersville
WHEELER RESERVOIR
WHEELER LAKE
TENNESSEE RIVER
LAUDERDALE CO
LAWRENCE CO
LIMESTONE CO
JOE WHEELER STATE PARK



Map 3.4: Rogersville Drainage Basins


Map 3.5: Rogersville Soil Slopes
Roads
Water
Wastewater Study Area
Rogersville City Limits
10 - 35
6 - 15
5 - 10
2 - 8
2 - 6
0 - 2
Northwest Alabama Council of Local Governments
May 2007
0
0.5
1
2
Miles
County Road 558
County Road 92
Mount Bethel
County Road 586
Skin Head
County Road 51
County Road 555
County Road 86
County Road 117
Holland
Motor Cross
Upper Snake
Tick Ridge
County Road 110
County Road 55
County Road 559
State Route 207
County Road 119
County Road 556
County Road 97
County Road 561
County Road 52
Snake
Higgins
Temperance Oak
County Road 637
Richter
County Road 113
County Road 84
County Road 571
Turner Lindsey
Garrett
Coleman
Haraway
Rogersville Heights
County Road 225
Field
County Road 125
Richardson
Anderson Creek
United States Highway 72
County Road 53
C R 569
C R 568
Ditto
Meadow
Turner
County Road 26
Rose
Lamar
County Road 567
County Road 566
Fir
Cherry
College
Church
Wheeler
Thornton
Hickory
Lurleen
Mackey
Greer
Lambs Ferry
Townview
Park
Dora
Omer
Cooper
County Road 165
County Road 562
County Road 563
County Road 70
Ricter
Adah
Casteel
County Road 572
County Road 573
Felker
Erica
1st Creek
River Front
Elk River Shores
Dement
Page
McLean
Tipton
Annie
Ind Pk
County Road 606
County Road 635
Henry
County Road 610
County Road 91
Hooie
York
Elk
Wheeler Dam
Campgrounds
Fuqua
Barnett
Elk River Park
Smith
Hampton Cove
United States Highway 72
Cottonmouth
Elk Point
Oak
Pine
Poplar
County Road 412
County Road 414
Ramblewood
County Road 608
Sharon
Jennifer
Elk River
Sales
County Road 605
Lambs Ferry
County Road 415
Finley
River Rat
County Road 314
Western Plains
County Road 150
Longshore
Thornton
Bluff
Naomi
County Road 271



Map 3.6: Rogersville Soil Septic Limitations

complex, near Dothan, was completed during the 1970s. Many of the natural resources in the state are managed by the Department of Conservation and Natural Resources.

3.7 Critical Sites

3.7.1 Historical Sites

A review of the National Register of Historic Places concludes that there are no listed sites within the boundaries of the Rogersville Sewer Study Planning Area. The State Historic Preservation Officer (SHPO) has indicated that prior to the development of detailed plans a submittal should be forwarded for the specific site to be assessed by a professional archaeologist. Prior to wastewater collection and/or treatment system construction, a more specific site evaluation should be submitted to the SHPO and clearance received for the specific site and project.

3.7.2 Landfill and Solid Waste Disposal(s)

There are no known landfill sites located within the boundary of the Rogersville Sewer Study Planning Area.

3.8 Hydrology

3.8.1 Hydrologic Cycle

The Earth's water is always in movement, and the water cycle, also known as the hydrologic cycle, describes the continuous movement of water on, above, and below the surface of the Earth. Since the water cycle is truly a "cycle," there is no beginning or end. Water can change states among liquid, vapor, and ice at various places in the water cycle, with these processes happening in the blink of an eye over millions of years. Although the balance of water on Earth remains fairly constant over time, individual water molecules can come and go in a hurry.

The water cycle has no starting point or ending point. The sun, which drives the water cycle, heats water in the oceans. Some of it evaporates as vapor into the air. Ice and snow can sublimate directly into water vapor. Rising air currents take the vapor up into the atmosphere, along with water from evapotranspiration, which is water transpired from plants and evaporated from the soil. The vapor rises into the air where cooler temperatures cause it to condense into clouds. Air currents move clouds around the globe, cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snowpacks in warmer climates often thaw and melt when spring arrives, and the melted water flows overland as snowmelt. Most precipitation falls back into the oceans or onto land, where, due to gravity, the precipitation flows over the ground as surface runoff. A portion of runoff enters rivers in valleys in the landscape, with stream flow moving water towards the oceans. Runoff, and ground-water seepage, accumulate and are stored as freshwater in lakes. Not all runoff flows into rivers. Much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface-water bodies (and the ocean) as ground-water discharge, and some ground water finds openings in the land surface and emerges as freshwater springs. Over time, the water continues flowing, some to reenter the ocean, where the water cycle renews itself.

The different processes are as follows:

Precipitation is condensed water vapor that falls to the Earth's surface. Most precipitation occurs as rain, but also includes snow, hail, fog drip, graupel, and sleet. Approximately 505,000 cubic km of waterfall as precipitation each year, 398,000 cubic km of it over the oceans.

Canopy interception is the precipitation that is intercepted by plant foliage and eventually evaporates back to the atmosphere rather than falling to the ground.

Snowmelt refers to the runoff produced by melting snow.

Runoff includes the variety of ways by which water moves across the land. This includes both surface runoff and channel runoff. As it flows, the water may infiltrate into the ground, evaporate into the air, become stored in lakes or reservoirs, or be extracted for agricultural or other human uses.

Infiltration is the flow of water from the ground surface into the ground. Once infiltrated, the water becomes soil moisture or groundwater.

Subsurface Flow is the flow of water underground, in the vadose zone and aquifers. Subsurface water may return to the surface (e.g. As a spring or by being pumped) or eventually seep into the oceans. Water returns to the land surface at lower elevation than where it is infiltrated, under the force of gravity induced pressures. Groundwater tends to move slowly, and is replenished slowly, so it can remain in aquifers for thousands of years.

Evaporation is the transformation of water from liquid to gas phases as it moves from the ground or bodies of water into the overlying atmosphere. The source of energy for evaporation is primarily solar radiation. Evaporation often implicitly includes transpiration from plants, though together they are specifically referred to as evapo-transpiration. Approximately 90% of atmospheric water comes from evaporation, while the remaining 10% is from transpiration. Total annual evapo-transpiration amounts to approximately 505,000 km3 of water, 434,000 km3 of which evaporates from the oceans.

Sublimation is the state change directly from solid water (snow or ice) to water vapor. Advection is the movement of water – in solid, liquid, or vapor states – through the atmosphere. Without advection, water that evaporated over the oceans could not precipitate over land.

Condensation is the transportation of water vapor to liquid water droplets in the air, producing clouds and fog.

Reservoirs

In the context of the water cycle, a reservoir represents the water contained in different steps within the cycle. The largest reservoir is the collection of oceans, accounting for 97% of the Earth's water. The next largest quantity (2%) is stored in solid form in the ice caps and glaciers. The water contained within all living organisms represents the smallest reservoir.

The volumes of water in the fresh water reservoirs, particularly those that are available for human use, are important water resources.

Volume of Water Stored in the Water Cycle's Reservoirs

Reservoir	Volume of water (106 km3)	Percent of total
Oceans	1370	97.25
Ice caps & glaciers	29	2.05
Groundwater	9.5	0.68
Lakes	0.125	0.01
Soil moisture	0.065	0.005
Atmosphere	0.013	0.001
Streams & rivers	0.0017	0.0001

Residence Times

The residence time of a reservoir within the hydrologic cycle is the average time a water molecule will spend in that reservoir (see the table below). It is a measure of the average age of the water in that reservoir, though some water will spend much less time than average, and some much more.

Groundwater can spend over 10,000 years beneath Earth's surface before leaving. Particularly old groundwater is called fossil water. Water stored in the soil remains there very briefly, because it is spread thinly across the Earth, and is readily lost by evaporation, transpiration, stream flow, or groundwater recharge. After evaporating, water remains in the atmosphere for about 9 days before condensing and falling to the Earth as precipitation.

In hydrology, residence times can be estimated in two ways. The more common method relies on the principle of conservation of mass and assumes the amount of water in a given reservoir is roughly constant. With this method, residence times are estimated by dividing the volume of the reservoir by the rate by which water either enters or exits the reservoir. Conceptually, this is equivalent to timing how long it would take the reservoir to become filled from empty if no water were to leave (or how long it would take the reservoir to empty from full if no water were to enter).

An alternative method to estimate residence times, gaining in popularity particularly for dating groundwater, is the use of isotopic techniques. This is done in the subfield of isotope hydrology.

Reservoir	Residence Time
Rivers	2 to 6 months
Atmosphere	9 days
Oceans	3,200 years
Glaciers	20 to 100 years
Seasonal snow cover	2 to 6 months
Soil moisture	1 to 2 months
Groundwater: shallow	100 to 200 years
Groundwater: deep	10,000 years
Lakes	500 to 100 years

Changes Over Time

The water cycle describes the processes that drive the movement of water throughout the hydrosphere. However, much more water is "in storage" for long periods of time than is actually moving through the cycle. The storehouses for the vast majority of all water on Earth are the oceans. It is estimated that of the 332,500,000 cubic miles (mi3) (1,386,000,000 km3) is stored in oceans, or about 95%. It is also estimated that the oceans supply about 90 percent of the evaporated water that goes into the water cycle. During colder climatic periods more ice caps and glaciers form, and enough of the global water supply accumulates as ice to lessen the amounts in other parts of the water cycle. The reverse is true during warm periods. During the last ice age glaciers covered almost one-third of Earth's land mass, with the result being that the oceans were about 400 feet (122 meters) lower than today. During the last global "warm spell," about 125,000 years ago, the seas were about 18 feet (5.5 meters) higher than they are now. About three million years ago the oceans could have been up to 165 feet (50 meters) higher.

The scientific consensus expressed in the 2007 Intergovernmental Panel on Climate Change (IPCC) Summary for Policymakers is for the water cycle to continue to intensify throughout the 21st century, though this does not mean that precipitation will increase in all regions. In subtropical land areas – places that are already relatively dry—precipitation is projected to decrease during the 21st century, increasing the probability of drought. The drying is projected to be strongest near the poleward margins of the subtropics (for example, the Mediterranean Basin, South Africa, southern Australia, and the Southwestern United States). Annual precipitation amounts are expected to increase in near-equatorial regions that tend to be wet in the present climate, and also at high latitudes. These large-scale patterns are present in nearly all of the climate model simulations conducted at several international research centers as part of the 4th Assessment of the IPCC.

Glacial retreat is also an example of a changing water cycle, where the supply of water to glaciers from precipitation cannot keep up with the loss of water from melting and sublimation. Glacial retreat since 1850 has been extensive.

Human activities that alter the water cycle include:

- Agriculture
- Alteration of the chemical composition of the atmosphere
- Construction of dams
- Deforestation and afforestation
- Removal of groundwater from wells
- Water abstraction from rivers
- Urbanization

Effects on Climate

The water cycle is powered from solar energy. 86% of the global evaporation occurs from the oceans, reducing their temperature by evaporative cooling. Without the cooling effect of evaporation the greenhouse effect would lead to a much higher surface temperature of 67B C, and a warmer planet.

Most of the solar energy warms tropical seas. After evaporating, water vapor rises into the atmosphere and is carried by winds away from the tropics. Most of this vapor condenses as rain in the Intertropical convergence zone, also known as the ITCZ, releasing latent heat that warms the air. This in turn drives the atmospheric circulation.

Effects on Biogeochemical Cycling

While the water cycle is itself a biogeochemical cycle, flow of water over and beneath the Earth is a key component of the cycling of other biogeochemicals. Runoff is responsible for almost all of the transport of eroded sediment and phosphorus from land to waterbodies. The salinity of the oceans is derived from erosion and transport of dissolved salts from the land. Cultural eutrophication of lakes is primarily due to phosphorus, applied in excess to agricultural fields in fertilizers, and then transported overland and down rivers. Both runoff and groundwater flow play significant roles in transporting nitrogen from the land to waterbodies. The dead zone at the outlet of the Mississippi River is a consequence of nitrates from fertilizer being carried off agricultural fields and funneled down the river system to the Gulf of Mexico. Runoff also plays a part in the carbon cycle, again through the transport of eroded rock and soil.

3.8.2 Groundwater

The major aquifers in the province are the Fort Payne-Tuscumbia, the Bangor Limestone, and the Hartselle Sandstone. The Fort Payne-Tuscumbia aquifer yields high capacity wells producing from 100 to 1000 gpm and serves more than 100,000 public water supply system customers. Springs are abundant and typically yield more than 100 gpm. The Highland Rim includes two of Alabama's biggest springs, Tuscumbia Big Spring and Huntsville Big Spring. The Bangor Limestone and Hartselle Sandstone supply minor amounts of groundwater, mostly from wells producing 10 gpm or less.

Thirteen percent of Alabama's population lives in the Highland Rim, accounting for 12 percent of Alabama's total water use. Only 9 percent of the state's total groundwater consumption occurs in the Highland Rim. Part of the reason for the low groundwater use is the Tennessee River system, which provides plentiful surface water to users throughout the province. Agricultural water use has increased dramatically in the past few years because the practice of irrigation is becoming more widespread.

Huntsville is the largest groundwater use in the Highland Rim, getting most of its water from wells and Brahan Spring. In addition, Madison County Water Authority and the Limestone County Water Authority depend entirely on groundwater for their water supply. Madison County has been a leader in the development of local groundwater protection efforts.

The Rogersville Water & Sewer Board currently produces all of its water from three (3) wells. The total permitted capacity of these wells is 1020 gallons per minute. Because the Town of Rogersville has experienced significant growth and anticipates continued growth, the Water & Sewer Board has recently drilled test wells in an attempt to develop an additional groundwater source. The board plans to continue its efforts to obtain this additional source. The location and recharge areas of these wells are shown on Map 3.7: Rogersville Wellhead/Source Water Sites.

3.8.3 Surface Water

Surface water exists as impounded waters and channelized waters. Impounded waters are found at various locations as permanent ponds and temporary pools, which evaporate shortly after rainfall. Channelized waters are ditches, streams, creeks and rivers that move waters from higher surface elevations through established channels toward lower surface elevations. The area has relatively good drainage characteristics due to the sloping topography and system of small drainage ditches and small streams. The Tennessee and Elk Rivers are the major streams in Lauderdale County. Both of these rivers touch the Rogersville Sewer Study Planning area. Runoff for the planning study area follows a fall line which separates three drainage basins- First Creek, the Elk River, and the Tennessee River. All channelized surface waters in the study area flow to Wheeler Lake and are temporarily impounded before being released through Wheeler Dam. Afterward, the waters flow the remaining length of the Tennessee River before entering the Mississippi and, eventually, the Gulf of Mexico.

Map 3.4: Rogersville Approximate Drainage Basins illustrates the approximate boundaries of drainage basins in the study area. These basins are important due to the expense involved in extending sanitary sewer service from one basin to another, which requires pumping stations at the low point of collection to force waste uphill to a crest where it may gravity flow to a treatment facility. Often, crossing several basins can require several such stations, increasing the cost associated with providing sewer service. These costs are important determinants of the feasibility of wastewater treatment services in some areas.

Wheeler Lake is located in north Alabama between Rogersville and Huntsville. Created by Wheeler Dam along the Tennessee River, it stretches 60 miles (96.5 km) from Wheeler Dam to Guntersville Dam. It is Alabama's second largest lake at 67,100 acres (272 km2). Decatur operates the busiest port along the Tennessee River on this lake, Port of Decatur. Wheeler Lake is a major recreation and tourist center, attracting about four million visits a year. Along with camping, boating, and fishing, visitors enjoy the Wheeler National Wildlife Refuge several miles upstream from the dam. The lake and dam are named for General Joseph "Joe" Wheeler.

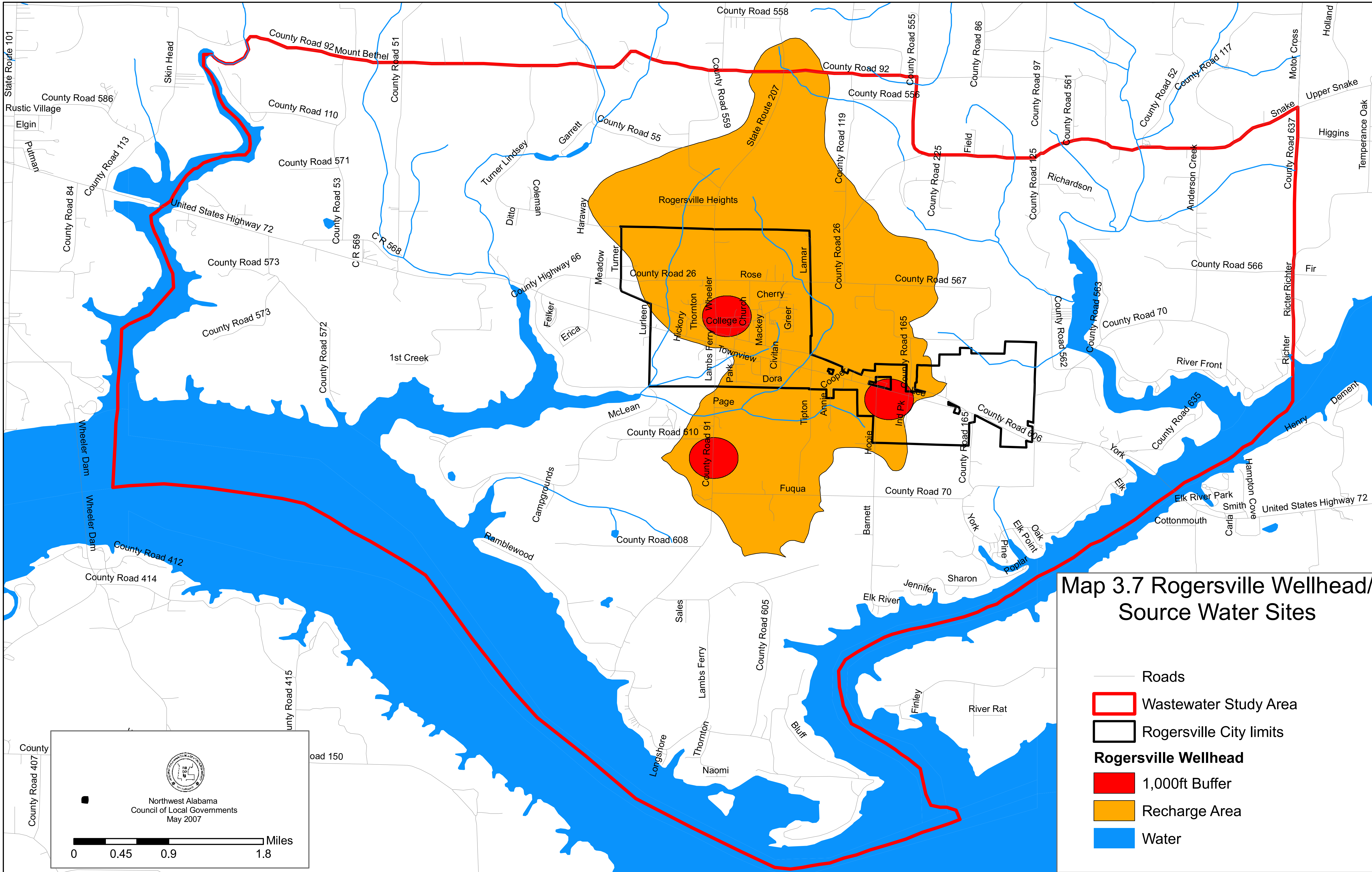
The Elk River rises in Grundy County, Tennessee, in Burroughs Cove near the aptly named tiny community of Elkhead. It is bridged for the first time by State Route 50 near Pelham, Tennessee. At first it flows southwestward, and turns to flow more generally westward. It is then bridged by both U.S. Highway 41 and Interstate 24. Shortly below this point, it forms the Coffee County-Franklin County line. It is first impounded by Elk River Dam, forming Woods Reservoir, the impoundment of which extends upstream to about the same port where the steam ceases to serve as the Coffee-Franklin County line and is entirely in Franklin County. This reservoir was built under the auspices of the United States Army Corps of Engineers, primarily to provide a large source of cooling water for the U.S. Air Force's Arnold Engineering Development Center, which has large wind tunnels and other military and scientific research equipment, and is also referred to as Arnold Air Force Station and Arnold Air Force Base in honor of aviation pioneer and "father of the Air Force" General Harry "Hap" Arnold. This area is also used as a wildlife refuge. The reservoir is bridged by State Route 127.

Only a few miles below Elk River Dam is the beginning of slack water caused by the Tims Ford Dam of the Tennessee Valley Authority. The slack water extends upstream to the vicinity of the small town of Estill Springs. There it is bridged by U.S. Highway 41 Alternate. Backwaters of the Tims Ford project also extend into the nearby town of Winchester, county seat of Franklin County, even though the main channel of the Elk runs to the west. A considerable amount of leakage from the reservoir is observed along State Route 50 in the form of what appears to be large springs along the north side of that road but are in fact leaking of the reservoir waters through the porous limestone rock of the area. This phenomenon has resulted in a locally popular source of water for livestock and other uses for which filtration and treatment of the water to be used is unnecessary. State Route 50 again crosses the Elk just below Tims Ford Dam.

Shortly below the dam, the stream becomes the boundary between Franklin County and Moore County, and then subsequently between Moore County and Lincoln County. The stream begins to meander several miles below to serve, as the county line is Dickey Island. It is bridged near the small community of Kelso, site of a cave used as a saltpeter mine by Confederates during the Civil War, by U.S. Highway 64. The Elk flows just south of the Lincoln County seat of Fayetteville. Until the late 1960s there was a "dry" stone masonry bridge (one in which the stones are held in place by the power of gravity forcing them against each other, nor mortar) over the Elk here; it was destroyed by a flood. Several miles west of Fayetteville, it is crossed by State Route 274, a highway built on an old railroad bed. It then crosses into Giles County, where it is bridged by the CSX Railroad and Interstate 65 before flowing just south of its small namesake town of Elkton, Tennessee, where it is bridged by U.S. Highway 31. Slightly southeast of Elkton is the mouth of Richland Creek, a fairly sizeable tributary. A few miles below this point it crosses into Limestone County, Alabama, where it meets the Tennessee River.

3.8.4 Flooding

The Town of Rogersville and surrounding areas have isolated and localized flooding due to local drainage patterns. The major areas subject to flooding are located within the one percent annual floodplain along First Creek, Elk River and the Tennessee River[5]. These areas are subject to construction regulations concerning the elevation or anchoring of structures and the protection of facilities from infiltration by floodwaters. From the


Map 3.7 Rogersville Wellhead/
Source Water Sites
Roads
Wastewater Study Area
Rogersville City limits
Rogersville Wellhead
1,000ft Buffer
Recharge Area
Water
Northwest Alabama
Council of Local Governments
May 2007
0
0.45
0.9
1.8
Miles
State Route 101
Rustic Village
Elgin
Putman
County Road 586
Skin Head
County Road 92 Mount Bethel
County Road 51
County Road 558
County Road 92
County Road 555
County Road 556
County Road 86
County Road 97
County Road 561
County Road 52
County Road 117
Motor Cross
Holland
Upper Snake
Snake
Higgins
Temperance Oak
County Road 110
County Road 571
County Road 113
County Road 84
County Road 53
United States Highway 72
County Road 573
C R 569
C R 568
Turner Lindsey
Garrett
County Road 55
County Road 559
State Route 207
County Road 119
County Road 225
Field
County Road 125
Richardson
Anderson Creek
County Road 637
Coleman
Ditto
Haraway
Rogersville Heights
County Highway 66
Meadow
Turner
County Road 26
Rose
Lamar
Cherry
County Road 567
County Road 566
Fir
Ricter Richter
Richter
County Road 70
County Road 563
County Road 562
River Front
County Road 572
1st Creek
Felker
Erica
Lurleen
Hickory
Thornton
Wheeler
College
Church
Mackey
Greer
Civitan
Lambs Ferry
Townview
Park
Dora
Cooper
Page
Annie
Tipton
County Road 165
Ind Pk
County Road 606
County Road 635
Dement
Henry
York
Elk
McLean
County Road 610
County Road 91
Hoole
Fuqua
Campgrounds
Ramblewood
County Road 608
Barnett
Elk River Park
Smith
Hampton Cove
United States Highway 72
Cottonmouth
Carla
Pine
Elk Point
Oak
Poplar
Sharon
Jennifer
Elk River
Wheeler Dam
County Road 412
County Road 414
County Road 415
Sales
Lambs Ferry
County Road 605
Finley
River Rat
Bluff
Longshore
Thornton
Naomi
County Road 407
County
County Road 150

attached maps (see Appendix A) one can see that the designated Flood Hazard Areas in Rogersville are along Neely Branch and Weaver Branch. The Flood Hazard Areas are generally 200-300 feet wide.

3.9 Prime Farmland

The Rogersville study area contains a significant number of small agricultural areas interspersed with residential development. The area historically has been a producer of common agricultural products within the limitations imposed by slope (minimal) and soils composition (minimal to moderate). According to the Soil Survey of Lauderdale County, Alabama the following soils are identified with Prime Farmland:

Dickson Silt Loam	DoA
Decatur Silt Loam	DoB
Dewey Silt Loam	DoC

3.10 Air Quality

The air quality of Lauderdale County has improved in the past two decades. The levels of Certain Pollutants such as sulfur dioxide (SO_2) and carbon monoxide (CO) are still higher than many areas of the southeastern United States. In a Federal Register notice published March 3, 1978, Lauderdale and Colbert Counties, Alabama, were designated as nonattainment for SO_2. On April 8, 1992, the Air Division of ADEM submitted a request for Colbert and Lauderdale Counties to be redesignated to attainment for SO_2. This request was based on five years (1987 – 1991) of quality assured monitoring data obtained from four ambient monitors located in both countries which showed that Colbert County and Lauderdale County had not violated the National Ambient Air Quality Standard (NAAQQS) for SO_2. The State has also implemented controls to reduce emissions to the level indicated by dispersion modeling. The State of Alabama has met all of the Clean Air Act Amendments of 1990 (CAA) requirements for redesignated pursuant to 107(d)(3)(E). SS 107(d)(3)(E)(i) The Administrator has determined that the area has attained the National Ambient Air Quality Standard.

On April 18, 1992, the Alabama Department of Environmental Management (ADEM) submitted a request for redesignation to attainment for sulfur dioxide (SO_2) in Colbert and Lauderdale Counties, Alabama. The redesignation request included five years of quality assured monitoring data which showed no exceedances of the National Ambient Air Quality Standards (NAAQS) for SO_2. The States has also implemented controls to reduce emissions to the level indicated by dispersion modeling. EPA redesignated Colbert County, Alabama, and Lauderdale County, Alabama to attainment for sulfur dioxide (SO_2).

TVA Plant Colbert comprises the only significant source of SO_2 emissions in Lauderdale and Colbert Counties. Therefore, all SO_2 emissions reductions came from this source. TVA Plant Colbert's new allowable emission rate of 2.2lbs SO_2 emitted/mmBTU was made permanent and federally enforceable through a specific SIP revision published January 23, 1990 at 55 FR 2235. The revision was made to ensure that no emission limit reflects credit for the use of any stack height greater that Good Engineering Practice (GEP). Dispersion modeling results for Plant Colbert showed that it would be necessary to revise the allowable SO_2 emissions rate from 4.0 lbs SO_2 emitted/mmBTU to 2.2lbs. SO_2 emitted/mmBTU. This reduction of credit for stack heights in excess of GEP ensured protection of the NAAQS at ground level as well as decreasing interstate impacts from SO_2 transport. Therefore, permanent enforceable SO_2 emissions reductions have been made through State and Federal Programs.

National air quality standards consistently rate the level of air pollution in the study area, as measured in neighboring Colbert County as "good". Few days in the series (1996-2006)[6] were "moderate" and very few were "unhealthy for sensitive groups". No days were "unhealthy". This rating indicates that there have been no significant hazards associated with air pollution in the study area.

3.11 Government Services

The Town of Rogersville operates under a Mayor and City Council form of government, with the mayor and council members elected every four years in at large elections. The Council meets monthly and at special times when called by the Mayor. The mayor serves full-time in a weak executive capacity, without veto authority. The mayor is the administrative head of the Town, but must have the approval of the City Council to replace most city employees. The Town offers police, fire, garbage pickup, public works and recreation services, overseen by a department head accountable to the Mayor and Council. Planning services are handled by the Town's administrative staff, supervised by the Mayor and Town Clerk. The Town has a part-time building inspector, who enforces a zoning ordinance and the Southern Standard Building Code. Wastewater treatment is provided in some areas of the study area by the Rogersville Water and Sewer Board, a quasi-independent board appointed by the Council with administrative control over the Town's water and sewer utilities. Map 3.8 and Map 3.9 depict the location of Town of Rogersville facilities.

3.12 Transportation System

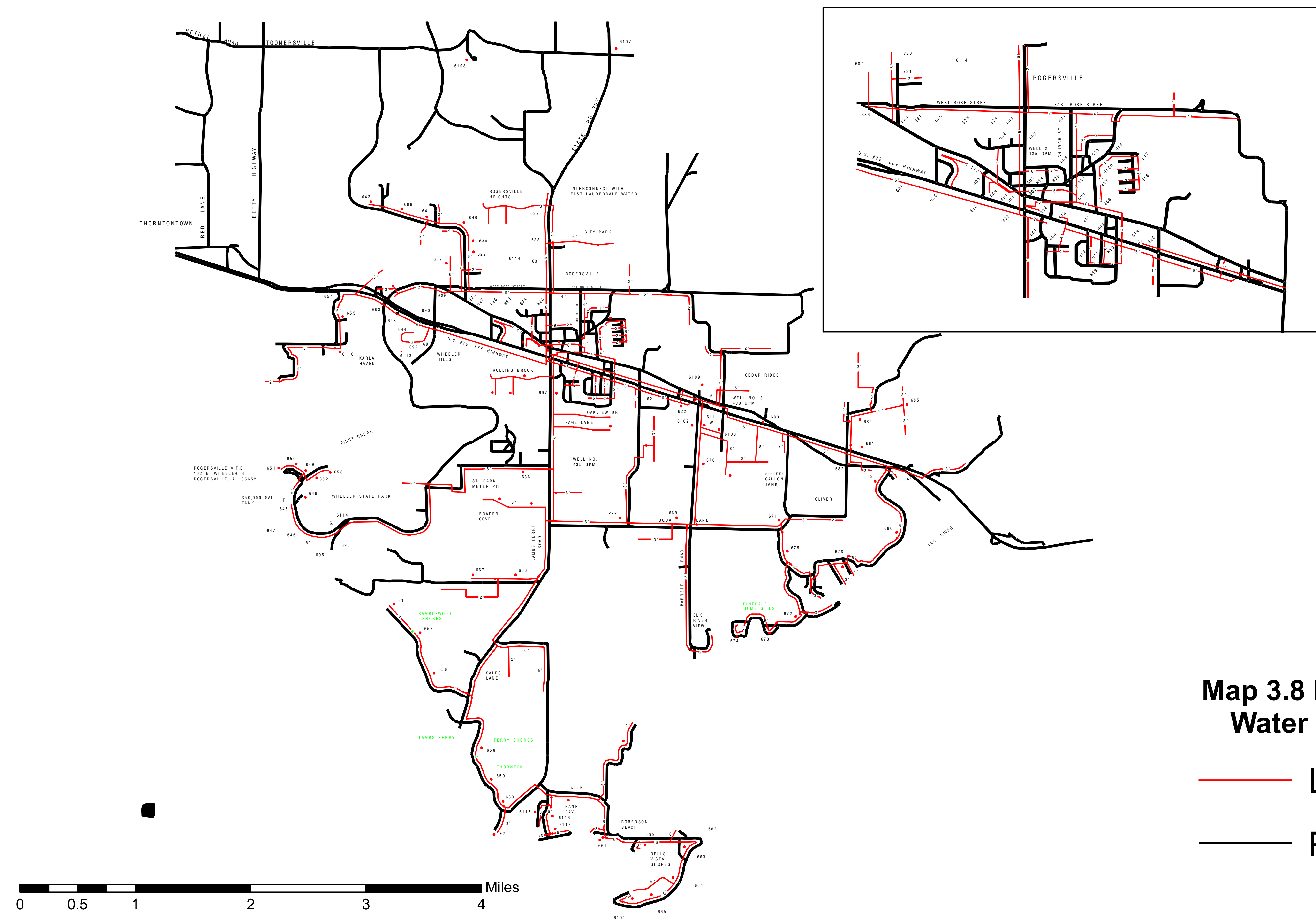
The Tennessee River and Highway 72 and are the most significant transportation features in the study area. The Tennessee River is the source of some river traffic into the study area. Primarily recreational, this traffic is very small but potentially significant as the area grows as a destination for recreational boating. The land transportation network is much more significant at present and is centered around Highway 72, which is a regional arterial connecting North Alabama to North Mississippi , East Tennessee, and North Georgia. The street pattern in the study area reflects the prominence of Highway 72. Local streets feed collectors and minor arterials. The majority of minor arterial traffic enters Highway 72 and flows east to west. Major access east and west is by Highway 72. Access from the north is provided by State Route 207 and adjacent roads. From the south County Road 91 and adjacent roads lead to the center of Rogersville.

3.13 Recreation

Significant recreational opportunities exist within the study area. Also the Town of Rogersville operates a City Park on Alabama Highway 207, just north of town. The Rogersville City Park provides baseball and softball fields, picnic areas, tennis courts, soccer fields and an amphitheatre. The greatest recreational asset to Rogersville is probably nearby Joe Wheeler State Park, located on Wheeler Lake of the Tennessee River. Joe Wheeler State Park is located approximately 2 miles from the Town. The Park is divided into three units:

- Resort Area
- Elk River
- Wheeler Dam

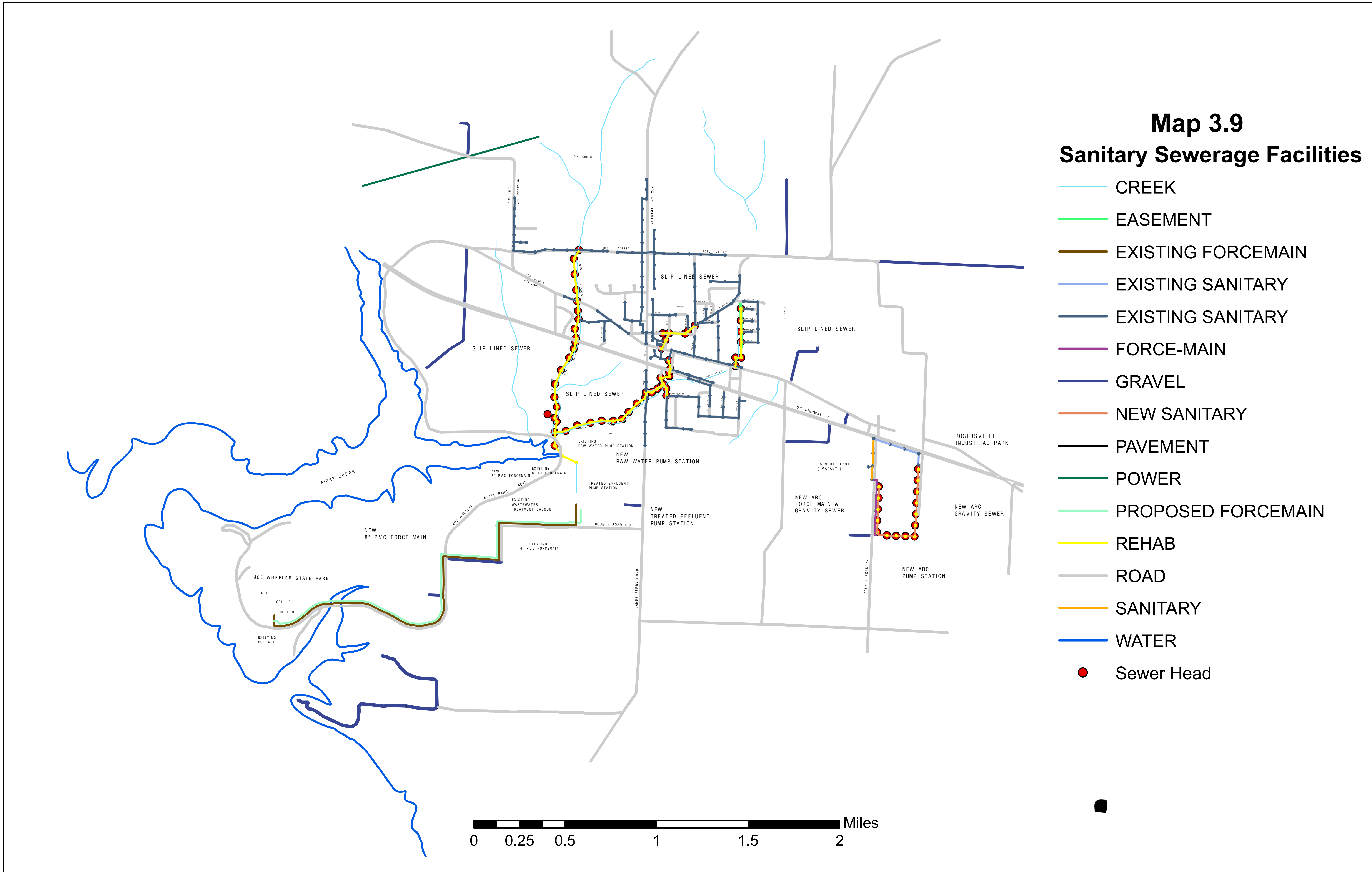
Joe Wheeler State Park provides facilities for camping, cabins, lodge, fishing, golf, tennis, swimming, and picnic areas. The proximity of the study area to the Tennessee River and Joe Wheeler state park are two factors likely to influence the growth and development of the Town and its surroundings.



Map 3.8 Rogersville Water Facilities

LINE

PAVEMENT


Map 3.9
Sanitary Sewerage Facilities
CREEK
EASEMENT
EXISTING FORCEMAIN
EXISTING SANITARY
EXISTING SANITARY
FORCE-MAIN
GRAVEL
NEW SANITARY
PAVEMENT
POWER
PROPOSED FORCEMAIN
REHAB
ROAD
SANITARY
WATER
Sewer Head
0
0.25
0.5
1
1.5
2
Miles
SLIP LINED SEWER
SLIP LINED SEWER
SLIP LINED SEWER
SLIP LINED SEWER
NEW RAW WATER PUMP STATION
NEW TREATED EFFLUENT PUMP STATION
NEW 8" PVC FORCE MAIN
JOE WHEELER STATE PARK
FIRST CREEK
NEW ARC FORCE MAIN & GRAVITY SEWER
NEW ARC GRAVITY SEWER
NEW ARC PUMP STATION
ROGERSVILLE INDUSTRIAL PARK
U.S. HIGHWAY 72

3.14 Water System Analysis

Existing

The existing Rogersville Water Distribution system is shown on Map 3.8. The system consists of cast iron, PVC, and galvanized steel mains of 2" through 8" diameters. The system currently serves 1553 customers.

Three Water Tanks provide storage for the Rogersville Water System.

• Downtown Tank	60,000 gallon elevated
• Joe Wheeler State Park	240,000 gallon elevated
• Industrial Park	500,000 gallon standpipe
Total Storage	800,000 gallon

The source of water for Rogersville is from three wells:

• Downtown Well	135 gpm
• Lambs Ferry Road Well	435 gpm
• Industrial Park Well	400 gpm
Total Capacity	970 gpm

Future

The existing distribution system serves not only the incorporated Rogersville area but also virtually all of the Sewer Study planning area. The Rogersville Water and Sewer Board is currently actively pursuing a new well and a new water storage tank on the north side of the sewer area.

3.15 Wastewater Treatment System Analysis

The sewerage facilities that service the Town of Rogersville were constructed in 1968. The existing lagoon system has a treatment capacity of 400,000 gpd (gallons per day). Not infrequently during wet weather, the system is inundated with flow rates in excess of 500,000 gpd. The system has undergone some recent repairs to leaking lines, as well as the expansion of services to the Rogersville Industrial Park. There are presently 670 residential customers. The largest single user is Lauderdale County School (K-12) at Rogersville. Blue Star Ready Mix Concrete, located in the Rogersville Industrial park, is the only major industrial customer. There are presently no major commercial customers in Rogersville. Most of the system's customers are residential customers; few customers reside outside of the corporate limits. See Section 8.0 and 9.0 for additional information regarding the Rogersville Sewer System.

4.0 Demographic Trends, Projections and Forecast

4.0 DEMOGRAPHIC TRENDS, PROJECTIONS AND FORECAST

This section establishes a baseline forecast for trends in population growth and demographic change for the Town of Rogersville and surrounding areas. Data for the study area (see Map 4.1: Wastewater Study Area- Census Divisions) is composite in nature and is composed of two main areas- the incorporated Town of Rogersville and the surrounding unincorporated territory that makes up the potential 20-year service area for wastewater treatment facilities. Data is presented for "Rogersville", meaning the current incorporated boundaries, for "Adjacent Territory" and for the "Study Area", which is the aggregate of both subcategories. The purpose of this chapter is to assemble a reasonable forecast of likely population growth in and around Rogersville from available data, utilizing projection methods yielding results in a low-

4.1 Current Population Profile and Trends

The population of Rogersville was 1199 according to 2000 U.S. Census reports[1]. The population of in the unincorporated portions of the study area was 2789 as of the 2000 U.S. Census. Taken together, these census totals establish a 2000 population of approximately 3988 persons in the study area.

For the entire study area, the 2000 Census indicates an increase of 30.75% from the 1990 population of 3050 to 3988 in 2000. Comparatively, the population of Lauderdale County increased 10.42% from 1990 to 2000. The incorporated areas of Rogersville grew from 1125 to 1199, 6.58%, in the same period. Meanwhile, the majority of growth occurred in the unincorporated territory surrounding Rogersville, which grew from 1925 in 1990 to 2789 in 2000, a change of 168.78%. Table 4.1: Population Growth by Location presents these estimates. These trends indicate tremendous growth potential in the areas immediately adjacent to Rogersville compared to both the incorporated Town as well as the remainder of the county. The introduction of centralized sewer service and other urban services into this area is likely to enhance growth potential, while also enhancing the efficiency of land use and service provision.

Table 4.1: Population Growth by Location	1990 Census Population	2000 Census Population	Numeric Change	Percentage Change
Study Area	3050	3988	938	30.756%
Rogersville	1125	1199	74	6.58%
Unincorporated Study Area	1925	2789	864	44.88%
Lauderdale County	79661	87966	8305	10.43%

4.2 Population Forecasts for Rogersville

Several projection methodologies are used to forecast the population of the Town and the study area in the 20 year planning horizon. First, traditional arithmetic and geometric projections are used to forecast the population of the study area, the Town of Rogersville, and unincorporated areas of the study area based on historical trends. Then, through a "step-down" calculation, the population of the study area is forecast based on the 1990 and 2000 ratios of study area population to county-wide population and the 20-year forecast for Lauderdale County. Although each forecasting method provides different outcomes, based on the assumptions and limitations inherent in each, comparisons across methods provide significant insight into the composition and likely future distribution of population in the study area.

4.2.1 General Assumptions and Limitations

The methods used are those of population *projection*, which indicates only likely trends and not absolute values and are not presented as absolute numerical values or goals for population levels in the planning period. These projections are dependent upon the absolute adherence to the assumptions included in the projection method. Some methods project high growth, others low or moderate. Since these assumptions rarely, if ever, obtain in full the population *forecast* is generated, representing a mixture of these assumptions. The forecast is obtained by averaging the results of the derived projections.

4.2.2 Arithmetic Projections

The simplest of the various methods of population forecasting first calculates the numeric increase in population across a time period, from 1990 to 2000, and then assumes a similar increase will occur in the future. In this method of forecasting, population increases by a static amount over each time interval (5-year period in the present analysis). The major limitation of this method is that it does not incorporate any considerations regarding the *rate* of change in population, instead producing a straight-line result that does not accurately reflect the potential long-run impact of population growth. Each time period adds a set number of new individuals to the population and, as population grows from this accumulation, each interval adds a smaller and smaller proportion of the *total* population. The result is a potentially inaccurate forecast in situations where population is increasing at a steady rate proportionate to total population (i.e. where the concentration of population living in an area leads to more people wanting to live in that area). Nonetheless, under conditions where data is limited, which is the case with respect to Rogersville and, moreover, the remainder of the wastewater study area, this type of forecast is useful to illuminate the general trend in population dynamics. The results of this forecasting method (see Table 4.2) indicate moderate population growth within the incorporated Town limits and significantly higher growth in the unincorporated Town. The cumulative effect of the arithmetic projection is a forecasted 58.8% increase in the total study area population, up to a population of 6333 by 2025.

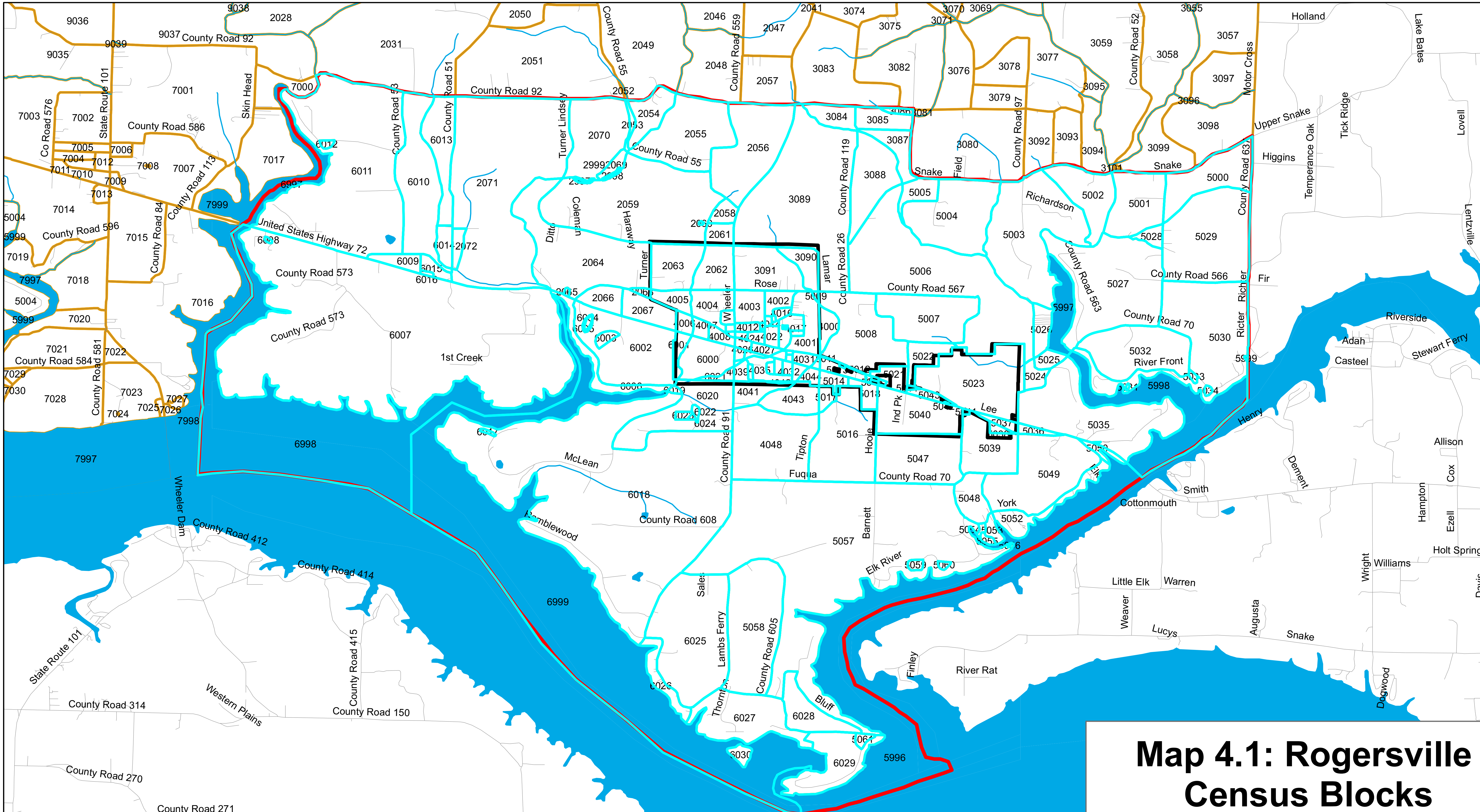
Table 4.2: Arithmetic Projection

	1990	2000	2005	2010	2015	2020	2025
Study Area	3050	3988	4457	4926	5395	5864	6333
Rogersville	1125	1199	1236	1273	1310	1347	1384
Unincorporated Study Area	1925	2789	3221	3653	4085	4517	4949
Lauderdale County	79661	87966	92119	96271		104576	108729

Numeric Change	
Study Area	938
Rogersville	74
Unincorporated Study Area	864
Lauderdale County	8305

4.2.3 Geometric Projections

The next forecasting method is calculated based on the proportionate rate of change in population from 1990 to 2000. In this method, population increases in each five-year interval based on a constant rate. The primary



Map 4.1: Rogersville Census Blocks

Rogersville City limits

Roads

Water

Wastewater Study Area

0 0.5 1 2 Miles

Northwest Alabama Council of Local Governments
May 2007

assumption (and primary deficit) of this method of forecasting is that the 1990-2000 rate of population growth will hold constant in the future. A number of important changes (including the introduction of urban services into previously underserved areas) might affect changes in growth rates. However, as before, data availability is low for Rogersville and the unincorporated areas of the wastewater study area. Table 4.3 shows the results of this method of forecasting. Under these assumptions, which represent high-end expectations of growth for the study area as a whole (115.2% from 2005 to 2025), the Town contributes a much smaller share of the total growth compared to phenomenal growth in unincorporated population.

Table 4.3: Geometric Projection

	1990	2000	2005	2010	2015	2020	2025
Study Area	3050	3988	4595	6142	7174	8409	9888
Rogersville	1125	1199	1238	1278	1320	1362	1406
Unincorporated Study Area	1925	2789	3357	4864	5854	7047	8482
Lauderdale County	79661	87966	92438	97137	102075	107264	112717

Annualized Growth Rate (% yearly growth)	
Study Area	2.71%
Rogersville	0.64%
Unincorporated Study Area	3.78%
Lauderdale County	9.97%

4.2.4 "Step-Down" Forecast for Study Area

Finally, a step-down forecasting method was modeled, which represents the proportion of study area population to the population of the total county for the planning period. First, the population of Lauderdale County is forecast based on more complicated (and arguably more accurate because of data availability) methods. Then, the proportion of the study area's population to that of Lauderdale County is calculated for the years 1990 and 2000. Then the annualized change in population distribution in the county from 1990 to 2000 is calculated. Finally, the proportion of study are population to county population is calculated in five-year intervals from 2000 forward, allowing the trend toward higher concentrations in the study area to continue over the course of the population forecast. This advantage of this method is that it allows for conditions wherein the population of the wastewater study area is either a) growing faster than the rest of the county or b) people are migrating from other parts of the county to the wastewater study area. Either of these assumptions would result in a higher concentration of population in and around Rogersville as time passes, which is evident in the trend from 1990 to 2000[7]. The limitation of this assumption is that it is based on the premise that population will continue to concentrate in the study area, and that the rate of concentration will remain constant. As shown in Table 4.4, this forecasting method produces the most moderate overall outcomes, with the total study area population doubling during the course of the forecast.

Table 4.4: Step-Down Projection							
	1990	2000	2005	2010	2015	2020	2025
Study Area*	3050	3988					
Rogersville*	1125	1199	1227.07				
Unincorporated Study *Area	1925	2789	3327.93				
Lauderdale County**	79661	87966	91636	94983	98015	100749	103176

* Calculated based on annual change in the concentration of population in the region and Lauderdale County's overall population growth projections.
**Source: University of Alabama Center for Economic Research, Lauderdale County Population Projections

Annualized Change in Proportion of County Population	
Study Area	1.70%
Rogersville	-0.35%
Unincorporated Study Area	2.75%
Lauderdale County	--

4.2.5 Wastewater Study Area Population Trends

Each of the preceding projection methods encompasses a set of assumptions regarding the nature of growth in Rogersville and the adjacent territory. Although all trends point to growth in both the town and surrounding county, the degree of growth varies based upon the considerations accounted for mathematically by the projection method. Taken together, these forecasts produce a reliable indication of low growth rates inside Rogersville and moderate to high growth in the surrounding unincorporated areas. In order to project the cost and demand of wastewater facilities in the study area, this trend is represented by an average of all the preceding population forecasts. Additionally, these trends are presented for each of the components of the study area (the town and unincorporated areas) and the entire study area.

Table 4.5 summarizes these trends, which provide the foundation for the land use analysis and wastewater flow projections that follow. As shown, the population of the Town of Rogersville, exclusive of any annexation, is forecast to grow by 10.13% to 1359 in 2025. The population of the unincorporated areas of the wastewater study area is forecast to double (increase by 100.7%) to 6627 by 2025. The study area in its entirety is forecast to increase by 70.06% to 7986 individuals by 2025. The effects of this projected population growth on land use and, in turn, wastewater facilities, is explored in the following sections.

Table 4.5 Projection Summary and Forecast				
			Numeric Change	Percentage Change
Arithmetic Projection	2005	2025	20	0.99%
Study Area	4457	6333	1876	29.62%
Rogersville	1236	1384	148	10.69%
Unincorporated Study Area	3221	4949	1728	34.92%
Lauderdale County	92119		16610	15.28%
Geometric Projection	2005	2025		
Study Area	4595	9888	5293	53.53%
Rogersville	1238	1406	168	11.96%
Unincorporated Study Area	3357	8482	5125	60.42%
Lauderdale County	92438	112717	20279	17.99%
Proportion of County Population	2005	2025		
Study Area	4555	7737	3182	41.13%
Rogersville	1227	1287	60	4.66%
Unincorporated Study Area	3328	6450	3122	48.41%
Lauderdale County	91636	103176	11540	11.18%
Mean of Forecasting Methods				
Average Forecast	2005	2025		
Study Area	4536	7986	3451	78.06%
Rogersville	1234	1359	125	10.13%
Unincorporated Study Area	3302	6627	3325	100.7%
Lauderdale County	92064	108207	16143	17.53%

5.0 Economic Analysis

5.0 ECONOMIC ANALYSIS

The following section provides basic information on employment, income and industrial characteristics within the Town of Rogersville and surrounding areas. This information is provided as a guideline for the potential for development within the study area as urbanization continues; however, portions of the study area are not included due to data limitations and the assumption that, as Rogersville grows and provides services promoting growth in adjacent territory, the unincorporated areas will more closely resemble incorporated territory. Where possible, data is presented at the level of aggregation nearest matching the Town limits or the full study area.

5.1 Labor Force Characteristics

The 2000 Census reported 432 workers 16 years of age or older in Rogersville. The majority of these workers commuted a considerable distance to their jobs, indicating that most worked outside of the Rogersville and the study area.

Table 5.1 Mean travel time to work for workers 16 and older	**Rogersville town, Alabama**
Total:	432
Did not work at home:	430
Less than 5 minutes	22
5 to 9 minutes	59
10 to 14 minutes	27
15 to 19 minutes	21
20 to 24 minutes	39
25 to 29 minutes	22
30 to 34 minutes	88
35 to 39 minutes	24
40 to 44 minutes	17
45 to 59 minutes	68
60 to 89 minutes	31
90 or more minutes	12
Worked at home	2

5.2 Income Characteristics

According to the 2000 Census, median household income in Rogersville was in $29779 in 1999; median family income was $37639; and per capita income was $16,435.

5.3 Industry Characteristics

Number of Establishments: 264

Number of Employees: 1344

Sales Volume ($1000): 408,063

Establishments classified as miscellaneous retail trade (SIC 58) and eating and drinking places (SIC 59) employ the largest number of people in the immediate Rogersville area[8]. A total of twenty eating and drinking places employ a combined 123 people, while the largest employment sector, miscellaneous retail trade, employs 154 individuals in 16 establishments. The large majority of industries in the area employ 4 or fewer individuals. Only two employ greater than 50 people. In terms of spatial distribution, businesses are scattered primarily along Highway 72, with an active retail cluster located at the intersection of Highway 72 and State Route 207.

Table 5.2 Establishments by Number of Employees					
Number of Employees					
1 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100+
189	42	21	8	1	1

2-digit SIC code	Table 5.3 Number of Establishments and Employment by Industrial Classification Industry Description	Number of	Number of
02	Agriculture production, livestock and animal specialties	2	4
07	Agricultural services	1	2
15	Building construction, general contractors, and operative builders	9	47
16	Heavy construction other than building construction contractors	2	16
17	Construction special trade contractors	10	42
24	Lumber and wood products, except furniture	1	5
27	Printing, publishing and allied industries	1	3
34	Fabricated metal products, except machinery and transportation equipment	1	2
35	Industrial and commercial machinery and transportation equipment	1	5
39	Miscellaneous manufacturing industries	2	4
42	Motor freight transportation and warehousing	4	6
43	United States postal service	1	4
44	Water transportation	2	4
48	Communications	1	1
49	Electric, gas, and sanitary services	2	31
50	Wholesale trade- durable goods	5	23
51	Wholesale trade-non-durable goods	9	33
52	Building materials, hardware, garden supply, and mobile home dealers	3	10
53	General merchandise stores	6	19
54	food stores	9	29
55	Automotive dealers and gasoline service stations	16	39
56	Apparel and accessory stores	5	28
57	Home furniture, furnishings, and equipment stores	5	97
58	Eating and drinking places	20	123
59	Miscellaneous retail	16	154
60	Depository institutions	3	72
62	Security and commodity brokers, dealers, exchanges, and services	1	15
64	Insurance agents, brokers, and service	4	30
65	Real estate	13	83
70	Hotels, rooming houses, camps and other lodging places	3	6

72	Personal services	24	71
73	business services	3	15
75	Automotive repair, services, and parking	9	29
76	Miscellaneous repair services	3	8
78	Motion pictures	1	2
79	Amusement and recreation services	5	21
80	Health services	7	11
81	Legal services	1	2
82	Educational services	2	15
83	Social services	5	27
86	Membership organizations	35	159
87	Engineering, accounting, research, management, and related services	2	11
91	Executive, legislative, and general government, except finance	1	3
92	Justice, public order, and safety	3	12
95	Administration of environmental quality and housing programs	1	1
96	Administration of economic programs	1	5
99	No classifiable establishments	3	15

6.0 Housing Analysis

6.0 HOUSING ANALYSIS

The following section contains an inventory and analysis of existing housing stock in the Town of Rogersville and the study area. It is based primarily on 1990 and 2000 Decennial Census and the results concerning the number and type of housing units, their age, and use.

6.1 Inventory of Units and Structural Characteristics of Housing

Table 6.1: Structural Characteristics

Type of Structure	**Number of Units in Structural Type**
1-unit detached	421
1-unit attached	7
2-unit, attached	19
3 or 4 units	42
5 to 9 units	22
10 to 19	11
20 to 49	0
50 or more	0
Mobile home	65
3 or more units	75
3 or more units	75

As of 2000, there were an estimated 587 housing units in Rogersville. Approximately 517 were occupied and 70 were vacant. Of all occupied units, an estimated 367 were owner-occupied and 150 were rented. Among vacant units, 27 were for rent, an additional 11 were for sale only, while 9 were for recreational or seasonal use only; no explanation was available for 21 vacant units. The median unit contained 5.6 rooms. Of all units, 421 were detached 1-unit structures; 7 units were attached 1-unit structures; 19 were 2-unit structures; 65 were mobile homes; and 75 were multifamily structures with 3 or more units.

Table 6.2 Housing Inventory	Number of Structures
Total dwelling units:	587
Vacant	70
Occupied	517
Owner occupied	367
Rental units	150
Vacant	70
For rent	27
For sale only	11
Recreational or seasonal	9

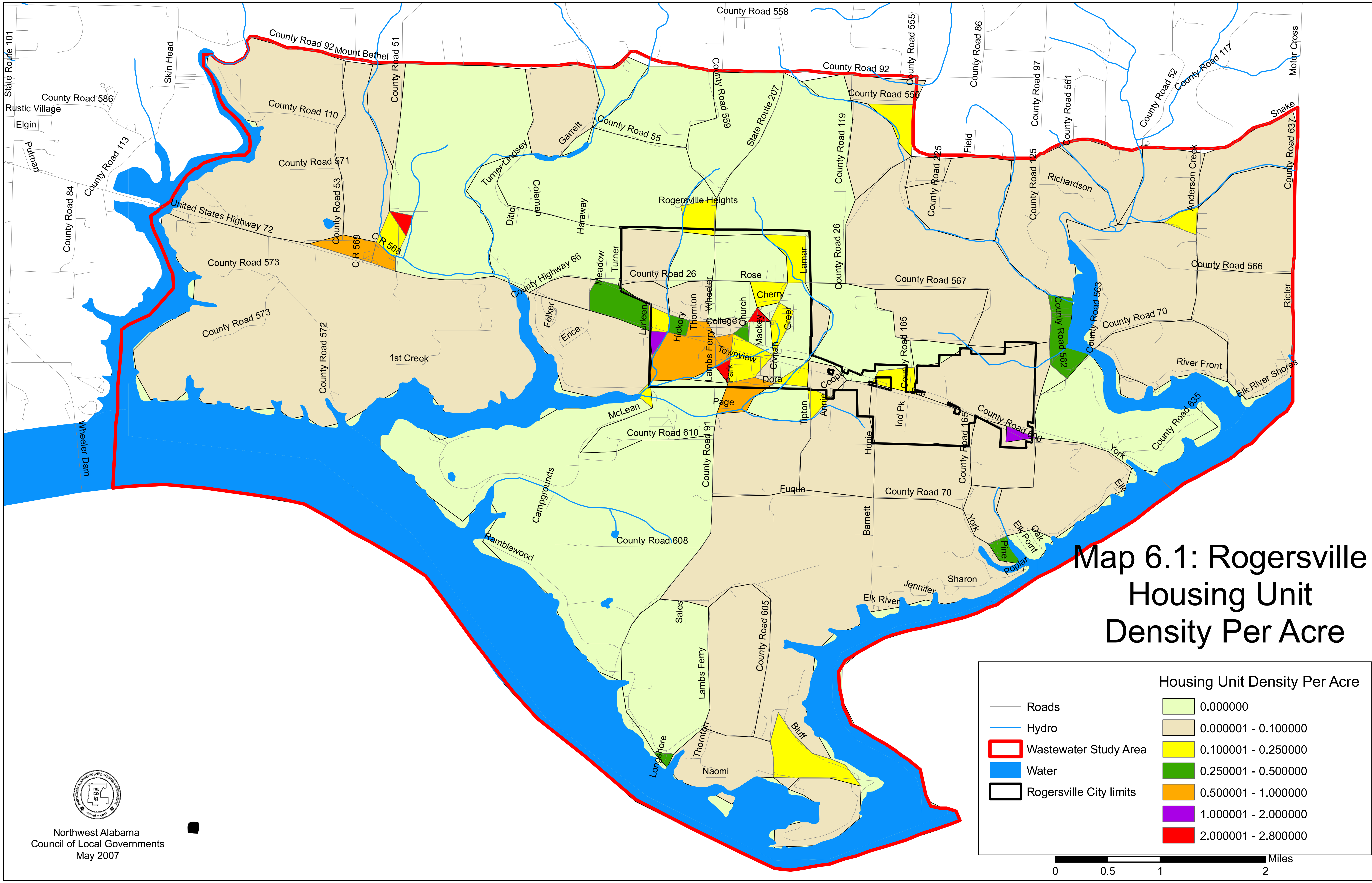
6.2 Age and Condition

The majority of structures were built before 1979. Gas and electricity accounted for a majority of the energy used for heating purposes. No units lacked complete plumbing facilities and only 3 housed more than one occupant per room (a measure of overcrowding). Comparatively, the state average in 2000 was 2.94% for units having more than one person per unit; an average of .56% of units lacked complete plumbing. The median value of a unit, typically a single-family residential dwelling, was $80,200; median value was $85,100 statewide in 2000. In owner-occupied units, the cost of home ownership was 24% or less of household income for 80.9%

of respondents. For renters, 48.7% reported paying 24% or less of household income on housing costs.

Table 6.3 Age of Structure	Total:	Built 1999 to March 2000	Built 1995 to 1998	Built 1990 to 1994	Built 1980 to 1989	Built 1970 to 1979	Built 1960 to 1969	Built 1950 to 1959	Built 1940 to 1949	Built 1939 or earlier
Number of Structures	587	6	38	75	84	107	96	70	50	61

Table 6.4: Housing Costs to Household Income		
Percentage of Household Income in 1999	Selected Monthly Owner Costs	Gross Rent
Less than 15%	58.4%	24.3%
15 to 19%	12.5%	9.5%
20 to 24%	10.0%	14.9%
25 to 29%	3.8%	7.4%
30 to 34%	5.0%	4.7%
Greater than 35%	9.7%	26.4%
Not computed	0.6%	12.8%


Map 6.1: Rogersville Housing Unit Density Per Acre
Housing Unit Density Per Acre
Roads
Hydro
Wastewater Study Area
Water
Rogersville City limits
0.000000
0.000001 - 0.100000
0.100001 - 0.250000
0.250001 - 0.500000
0.500001 - 1.000000
1.000001 - 2.000000
2.000001 - 2.800000
Miles
0
0.5
1
2
Northwest Alabama Council of Local Governments
May 2007
County Road 558
County Road 92
Mount Bethel
County Road 110
County Road 571
County Road 573
County Road 572
United States Highway 72
1st Creek
Wheeler Dam
County Road 586
Rustic Village
Elgin
County Road 55
Rogersville Heights
County Road 26
County Road 567
County Highway 66
County Road 610
County Road 608
County Road 605
County Road 70
County Road 566
River Front
Elk River Shores
Elk River
Lambs Ferry
Campgrounds
Ramblewood
Naomi
Sharon
Jennifer
Fuqua
McLean
Page
Townview
Cherry
Rose
College
Richardson
Snake
Motor Cross

7.0 Land Use Assessment

7.0 LAND USE ASSESSMENT

This section presents information regarding land use in the Rogersville Wastewater study area. This information is used to determine the existing capacity and demand for wastewater facilities and, combined with population projections, is useful for projecting the likely future demand for such facilities within the Town of Rogersville and in the adjacent territory.

7.1 Existing Land Use

Table 7.1 summarizes the existing land use in the Town of Rogersville and adjacent territory by types of land use. Map 7.1: Rogersville Land Use Inventory presents a detailed land use inventory for the Town and the adjacent territory out to the limits of the study area. Table 7.1 and 7.2 present land use inventories for the Town and for the adjacent unincorporated portions of the study area.

7.1.1 Residential Land Use

Residential land uses accounted for the largest portion of developed, non-agricultural property in both the Town limits and the unincorporated study area. Among residential uses, single-family dwellings accounted for the predominant type. Within the Town there were a total of 517 occupied housing units as of 2000, for an average occupancy of 2.32 individuals per unit (exclusive of vacant units). Housing unit density per acre was higher within the Town than in the unincorporated study area (see Map 6.1: Housing Unit Density within Census Blocks, 2000).

7.1.2 Commercial Land Use

Commercial land uses accounted for 2.5% of total land usage inside Rogersville and only 0.3% of the total in the unincorporated study area. Retail and service commercial was the largest category of commercial land usage for both portions.

7.1.3 Industrial Land Use

Industrial land use was approximately 1% of the land usage of Rogersville and 0.2% of the unincorporated study area. Light industrial properties outnumbered heavy industries by a considerable margin.

7.1.4 Public Land Use

Public lands accounted for 3.65 of the study area inside Rogersville and 5.5% in the unincorporated areas. The large percentage of public lands in the study area is accounted for mostly by the presence of Joe Wheeler State Park, which alone accounted for 4.9% of the unincorporated study area.

7.1.5 Vacant Land Use

Vacant property made up 16.3% of Town of Rogersville and 16.1% of the unincorporated study area. Within Rogersville there were a total of 535.26 acres of available vacant property, of which 89 acres was classified as urban vacant – or land with readily available infrastructure.

Table 7.1: Rogersville Existing Land Use Inventory	Number of Properties	Acres	Acres per capita	Percent of Total Area
Residential	**515.00**	**624.91**	**0.51**	**19.1%**

Single Family	495.00	592.19	0.48	18.1%
Duplex	4.00	8.31	0.01	0.3%
Manufactured Home	11.00	14.22	0.01	0.4%
Multi-Family	5.00	10.19	0.01	0.3%
Commercial	**97.00**	**83.35**	**0.07**	**2.5%**
Retail and Service	58.00	41.40	0.03	1.3%
Business Services	27.00	38.56	0.03	1.2%
Professional Service	12.00	3.39	0.00	0.1%
Industrial	**6.00**	**31.84**	**0.03**	**1.0%**
Heavy Industrial	1.00	7.87	0.01	0.2%
Light Industrial	5.00	23.97	0.02	0.7%
Public	**48.00**	**117.37**	**0.10**	**3.6%**
Government	2.00	3.97	0.00	0.1%
Institutional	32.00	52.99	0.04	1.6%
Parks and Recreation	4.00	27.54	0.02	0.8%
Cemetery	8.00	31.74	0.03	1.0%
Utilities	2.00	1.13	0.00	0.0%
Mixed Use	**4.00**	**17.29**	**0.01**	**0.5%**
Agricultural	**79.00**	**1864.66**	**1.51**	**56.9%**
Undeveloped	**115.00**	**535.26**	**0.43**	**16.3%**
Vacant	26.00	274.27	0.22	8.4%
Urban Vacant	89.00	260.99	0.21	8.0%
Total	**1645.00**	**3274.68**	**3.78**	**100.0%**

Map 7.1: Rogersville Land Use Inventory

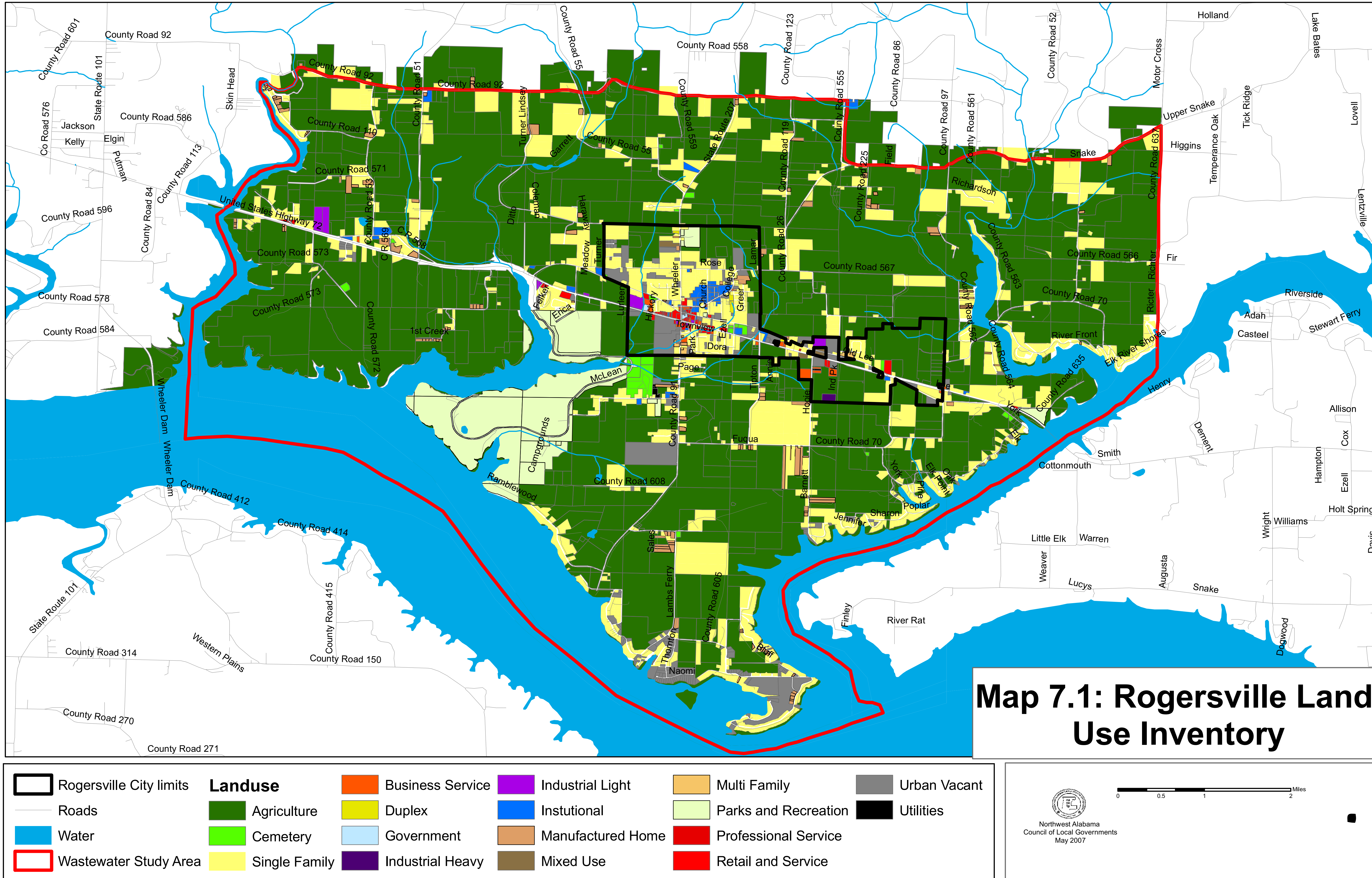


Table 7.2: Unincorporated Areas Existing Land Use Inventory	Number of Properties	Acres	Acres per capita	Percent of Total Area
Residential	**2263.00**	**4303.32**	**1.30**	**12.5%**
Single Family	2112.00	4045.16	1.23	11.7%
Duplex	4.00	8.31	0.00	0.0%
Manufactured Home	142.00	239.66	0.07	0.7%
Multi-Family	5.00	10.19	0.00	0.0%
Commercial	**107.00**	**94.66**	**0.03**	**0.3%**
Retail and Service	66.00	51.11	0.02	0.1%
Business Services	29.00	40.16	0.01	0.1%
Professional Service	12.00	3.39	0.00	0.0%
Industrial	**9.00**	**53.79**	**0.02**	**0.2%**
Heavy Industrial	0.00	0.00	0.00	0.0%
Light Industrial	9.00	53.79	0.02	0.2%
Public	**95.00**	**1885.47**	**0.57**	**5.5%**
Government	2.00	3.97	0.00	0.0%
Institutional	45.00	98.76	0.03	0.3%
Parks and Recreation	24.00	1675.35	0.51	4.9%
Cemetery	19.00	101.88	0.03	0.3%
Utilities	5.00	5.51	0.00	0.0%
Mixed Use	**4.00**	**17.29**	**0.01**	**0.1%**
Agricultural	**622.00**	**22639.97**	**6.86**	**65.5%**
Undeveloped	**436.00**	**5548.47**	**1.68**	**16.1%**
Vacant	177.00	4893.70	1.48	14.2%
Urban Vacant	259.00	654.77	0.20	1.9%
Total	**6446.00**	**34542.97**	**10.46**	**100.0%**

7.1.6 Other Land Uses

With the exception of agricultural land uses, which composed the largest percentage of land usage in both areas, other land uses accounted for a very small margin of total property throughout the study area. Constrained lands, or those with significant development difficulties such as floodplains and steep slope were a similarly small proportion of property.

7.2 Future Land Use

Future land use projections can be divided into two types: those focused on predicting the amount of land required for development (area projections) and those focused on predicting the population and workforce effects of growth and development. While land use patterns and area projections are vital for determining the cost of growth, it is impossible to accurately model the effects of density decisions. What is clear, however, is that sprawling development contains high costs in terms of infrastructure investment, maintenance, and re-development costs. The current land use patterns of the Town of Rogersville and the adjacent unincorporated study area are used to model land demand in the section that follows, however, the Town should evaluate land use policies increasing development density in order to maximize the benefit of wastewater investments. Meanwhile, workforce and housing characteristics of population growth can be used to establish a baseline for projecting demand for (wastewater) services. Typically, system design can accommodate additional demand for wastewater based on accepted performance metrics (presented in Section 8.0). Additional costs associated with the extension of lines, installation of pumping stations, and other appurtenances are dependent upon development density and other site-specific factors.

7.2.1 Projecting Demand for Additional Acreage

The methodology used for forecasting demand for property is to first determine the existing per capita ratio of land use types and then to calculate a demand forecast based upon population growth at the same rate of per capita land consumption, for each land use type, across the twenty year planning horizon. As with the land use inventory presented earlier, land demand forecasts are presented for the Town of Rogersville and the immediately adjacent territory, and the aggregate study area. Additional demand for commercial, industrial, or residential property is then incorporated based on foreseeable development trends and existing plans for features such as commercial and industrial parks. The assumption is that trends in population growth will create development pressures and that land currently vacant or in agricultural production will be redeveloped to meet the demand.[9]

Table 7.3 and Table 7.4 show the future land use forecasts for the target population of Rogersville and the adjacent study area. With a population of 1359 in 2025, as forecast in Section 4.0, the Town will require development on 88.6 additional acres of property at the same patterns of density that are currently practiced. This density level, which is currently practiced inside the town of Rogersville, is "Development Concept #1, Town Density Model".

Table 7.1 Development Concept #1: Town Density Model				
Area: Town of Rogersville				
Target Population: 1359				
Land Use	Current parcels	Current Acreage	2025 Acreage	Demand forecast
Residential				
Single-family	495	592.19	652.1768	59.98683144
Duplex	4	8.31	9.151775	0.841774716
Multi-family	5	10.19	11.22221	1.032212318
Mobile Home	11	14.22	15.66044	1.440437601
Commercial				
Business services	27	38.56	42.466	3.905996759
Professional services	12	3.39	3.733395	0.343395462
Retail and service	58	41.4	45.59368	4.193679092
Mixed Use	4	17.29	19.04142	1.751418152
Industrial				
Light industrial	5	23.97	26.39808	2.428079417
Heavy industrial	1	7.87	8.667204	0.797204214
Public and Institutional				
Cemetery	8	31.74	34.95515	3.215153971
Government	2	3.97	4.372147	0.402147488
Institutional	32	52.99	58.35771	5.367706645
Parks and recreation	4	27.54	30.32971	2.789708266
Utilities	2	1.13	1.244465	0.114465154
Total		874.76	963.3702	88.6
Vacant Land for Agriculture and Open Space				

"Development Concept #2, Rural Density Model", represents the density of development within the rural, unincorporated territory of the study area. Under this model, an additional 4711.8 acres will be required to accommodate development at the density of development.

Table 7.2: Development Concept #2: Rural Density				
Area: Unincorporated Study Area				
Target Population: 7986				
Land Use	Current parcels	Current Acreage	2025 Acreage	Demand forecast
Residential				
Single-family	2112	4045.16	8118.496	4073.336
Duplex	4	8.31	16.67788	8.367883
Multi-family	5	10.19	20.45098	10.26098
Mobile Home	142	239.66	480.9893	241.3293
Commercial				
Business services	29	40.16	80.59973	40.43973
Professional services	12	3.39	6.803613	3.413613
Retail and service	66	51.11	102.576	51.46601
Mixed Use	4	17.29	34.70043	17.41043
Industrial				
Light industrial	9	53.79	107.9547	54.16467
Heavy industrial	0	0	0	0
Public and Institutional				
Cemetery	19	101.88	204.4696	102.5896
Government	2	3.97	7.967653	3.997653
Institutional	45	98.76	198.2079	99.44791
Parks and recreation*	24	1675.35	0	
Utilities	5	5.51	11.05838	5.54838
Total			9391.0	4711.8
Vacant Land for Agriculture and Open Space				25159.9

7.2.2 Projecting Demand for Additional Residential, Commercial and Industrial Units and Employment

Residential land use: Demand for new residences was found by applying the household size (2.32 persons per unit in Rogersville) in 2000 to the 2025 projections, which results in a forecasted housing demand of 69 additional units for Rogersville. Household size within the Town was used to reflect the development pattern of the incorporated areas, under the assumption that sewer extension will be accompanied by incorporation and the newly incorporated areas will come to resemble the rest of the Town.

Table 7.3: Housing Unit Projection

	Target Population (2025)	Minus existing population (2000)	Divided by average household size, Rogersville (2000)	Equals Projected Additional Units	Plus existing number of housing units (2000)	Equals total number of housing units (2025)
Rogersville	1359	1234	2.32	69	517*	586
Unincorporated Areas	6627	2789	2.32	1654	1231	2885

*Occupied housing units, 70 vacant units exist and may fill demand for new construction but still affect wastewater service demand through increased population.

Commercial land use: Likely commercial growth is predicted on the basis of the number of establishments currently operating in Rogersville, their average employment, and their size (acreage). First, the establishments from Table 5.3 were assigned to the categories of commercial land use (retail, professional services, business service) found in the land use inventory. Then, the average employment per establishment within each category was calculated. Next, the average acreage of a commercial property was determined.

Demand for commercial establishments in Rogersville and the immediately adjacent unincorporated areas was determined based on employment data for the Town under the assumption that the unincorporated areas will grow to resemble the Town as sewer service, and presumably the corporate limits, are extended. To forecast the number of new commercial establishments in 2025, demand for new commercial property of each type (Table 7.4) was divided by the average size of a commercial property in 2005. To forecast new commercial employment in 2025, the number of new establishments was multiplied by the average employment of an establishment in 2005.

Table 7.4 Commercial Establishment and Employment Projections

	Demand for commercial property (2025)	Multiplied by average size of commercial property	Equals Projected number of new establishments	Times average employment per establishment	Equals Projected employment*
Rogersville					
Retail	3.9	0.70 acres	6	6.35	38
Professional services	.35	1.4 acres	0.5	3.77	2
Business services	4.19	1.4 acres	2.7	3.77	10
Unincorporated Study Area					
Retail	51.46	1.29	66.38	6.35	422

Professional services	3.41	3.54	12.07	3.77	46
Business services	40.4	.72	29.08	3.77	110

Industrial land uses: Industrial growth is forecast in the same manner as commercial growth, with information on the number of establishments and their employment in Rogersville being used to project likely new establishments as the population grows. Average employment and the average acreage of industries was calculated. Then, projected demand was divided by average size and the result (projected number of new establishments) was multiplied by the average employment per establishment.

Table 7.5 Industrial Establishment and Employment Projections

	Demand for industrial property (2025)	Multiplied by average size of industrial property	Equals Projected number of new establishments	Times average employment per establishment	Equals Projected employment*
Rogersville					
Light Industry	2.43	.21	1	4.59	5
Heavy Industry	.80	.13	0	4.59	0
Unincorporated Study Area					
Light Industry	54.16	.17	9	4.59	42
Heavy Industry	0	0	0	0	0

7.3 Summary

Based on demographic, economic, and land use characteristics of the Rogersville Wastewater Study Area, projections for wastewater demand should incorporate plans for 586 additional housing units within the Town of Rogersville and 2885 additional housing units in the adjacent unincorporated areas through 2025. Commercial wastewater usage is projected to increase with the location of approximately 14 additional establishments with approximately 50 employees within the incorporated Town limits and by 108 establishments with 578 employees. Industrial growth projections include demand for 10 total establishments with 47 employees in both the incorporated town and the unincorporated study area.

The projections included herein are based on trends observed in areas with access to sewer and areas without sewer access. These are the foundation of a wastewater demand model, which encompasses much of what has been observed about development in and around the town in areas with and without access to sewer services. Land use policies, including the location of commercial, industrial and residential properties and annexation policies governing the extension of services into the presently unincorporated portions of the wastewater study area, will dictate much of the pace and direction of growth in and around the Town of Rogersville. Areas with sewer access can be reasonably expected to develop at higher densities, effectively altering many of the assumptions underlying the development model. These projections, therefore, should be viewed as a the *baseline* demand model, to be reviewed, evaluated, and supplemented as necessary in light of future development trends.

8.0 Wastewater Flow Rates

8.0 WASTEWATER FLOW RATES

Wastewater flow rates are determined by a variety of population and economic factors in a community. Residential customer usage depends upon family size, cost and availability of water and cost and availability of treatment options. Commercial demand is dependent upon the typical user, which is defined by the commercial setting. Retail customers, for example, produce demand through system usage by employees and customers, whereas office customer demand arises from usage by employees only. Industrial usage likewise reflects the customers, employees and processes on site. Many industrial customers, as well as some commercial ones, are required to pre-treat discharges to public sewers. Demand is also heavily affected by the design of storm water drainage systems and whether these are combined with sewer systems or are separate from them. Even in separate systems, infiltration and inflow of storm waters into the system can present challenges for meeting wastewater demand.

In the system analysis that follows, standard metrics are derived from existing wastewater usage or from recognized sources to evaluate existing and likely future demand as a result of residential, commercial and industrial land uses. Residential demand is derived from existing water usage, 85% of which is assumed to reach the wastewater collection and treatment system of the Town. An analysis of the water usage data for the Town of Rogersville indicates that the average water usage is 7,160 gallons per month per customer or 239 gallons per day. Engineering standards are utilized to project demand for commercial and industrial collection and treatment. Commercial demand is calculated at 300 gpd/unit. Industrial demand is based upon an estimated 500 gpd/unit.

Existing demand stems from customers located primarily within the corporate limits. Very few customers outside of Rogersville in the wastewater study area are currently customers. The demand calculations that follow assume that the system will be designed with the capacity for each potential customer within the study area to tie into the system, regardless requirements for individual properties with existing subsurface disposal systems in good repair.

8.1 Existing Wastewater Demand Calculations

8.1.1 Existing Residential Wastewater Demand

The town's sewer system currently serves 670 residential customers. Based upon an estimated usage of 239 gpd per customer, with 85% of metered water entering the wastewater system, these customers produce demand of approximately

670 customers x 239 gpd/customer x 85% = 135,907 gpd.

8.1.2 Existing Commercial Wastewater Demand

There are presently no large commercial users on the Rogersville Sewerage System. The largest single user is Lauderdale County School at Rogersville (K-12). The school has a total of 987 students and a student teacher ratio of 17. Therefore the calculated population equivalent of the school is approximately 1,050. The Alabama Department of Public Health literature estimates a School Sewerage flow of 16 gallons per day per person.

1050 x 16 gpd = 16,800 gpd

In addition to this demand, there are approximately 97 existing commercial users within the Town, with an estimated usage of

97 x 300 gpd = 29,100 gpd

For a total commercial demand of approximately 45,900 gallons per day.

8.1.3 Existing Industrial Wastewater Demand

In 2003, The Rogersville Water and Sewer Board received an ARC Grant to provide sewerage facilities to its Industrial Park at U.S. 72 and County Road 77. The project included 8-inch sewer mains and a sewage pumping station.

At this time the Industrial Park Sewer System only serves the Blue Star Ready - Mix Concrete Plant, with an estimated 500 gpd usage.

8.1.4 Existing Demand Summary

Residential	135,907
Commercial	45,900
Industrial	500

Total System Demand = 182,307 gallons per day

Capacity = 400,000 gpd

Excess capacity = 400,000 – 182,307 = 217,693 gallons per day

To put the system capacity in perspective, at an average demand of 203.15 gallons per day per residential unit (239 gpd x 85% metered water entering system = 203.15), the current capacity would supply approximately 1072 new homes. However, likely patterns of growth will require the system to support a mixture of residential, commercial, and industrial uses (see Section 8.3).

8.2 Forecasted Wastewater Demand Calculations

This section seeks to provide insight into the likely future demand for wastewater services using land use analysis and population projections from preceding sections. Forecasted demand is calculated from existing population and per capita rates for the location of housing units, commercial, and industrial establishments, the forecasted growth in population for the next 20 years, and the average wastewater usage rates provided above. Projections are made for both the incorporated areas of Rogersville and the unincorporated study area. Finally, a reasonable build-out model is presented based on assumptions regarding the location or "capture" of future development within the boundaries of the Rogersville Sewer system's existing or expanded wastewater service area.

8.2.1 Forecasted Residential Wastewater Demand

Average household characteristics and population growth forecasts in and around Rogersville point to significant residential growth, particularly within the unincorporated territory immediately adjacent to the Town of Rogersville. Based on a demand for service for 1,359 persons occupying 585 housing units in 2025, the anticipated Town residential sewerage load will be:

585 x 239 x 85% =

118,843 gpd

The anticipated unincorporated residential demand for 2025 is 6,627 persons occupying 2,886 housing units. The anticipated unincorporated residential sewage flow will be:

2886 housing units x 239 x 85% =

586,291 gallons per day

Total residential demand for the entire wastewater study area is projected to be 705,131 gallons per day at full build-out in 2025 at current density levels.

8.2.2 Forecasted Commercial Wastewater Demand

In addition to the 97 existing commercial uses in the town, another 9 commercial customers are projected in 2025, for a total of 106 commercial customers.

(106 existing customers + 9 projected customers) x 300gpd/unit =

116 x 300 gpd/unit =

34,800 gpd

The unincorporated area commercial customer base is projected to total:

108 x 300 =

32,400 gpd (exclusive of existing units)

8.2.3 Forecasted Industrial Wastewater Demand

Industrial demand in town is projected to grow by 1 establishment by 2025, creating a total industrial customer base of 7.

(6 existing customers + 1 projected customer) x 500 =

7 x 500 gpd

= 3,500 gpd

Industrial growth in the unincorporated area is expected to grow to 9 units by 2025.

9 x 500 =

4500 gpd (exclusive of existing units)

8.2.4 Summary

Total Sewage Flow for the year 2025 is estimated to be (flow gallons per day):

Town	Unincorporated	Total

Residential	118,843	586,291	705,134
Commercial	31,800	32,400	64,200
Industrial	3,500	4,500	7,500
Total	154,143	623,197	776,834

8.3 Approximate Build Out of Existing Sewer Facilities

This section presents a potential build-out model for the Town of Rogersville based upon existing and forecasted demand. The model considers development based on population growth, which is assumed to drive the establishment of housing units, commercial enterprises and industrial enterprises at a per capita matching existing development. These units and enterprises, in turn, demand wastewater services. In reality, some growth will not be within the service area of the Rogersville Sewer System. These units will not be "captured" immediately by the sewer service area due to inadequate facilities or the infeasibility of extensions due to cost or location. The following assumptions are incorporated into these projections: 100% of all new development in the Town of Rogersville's existing corporate limits will be tied to the sewer system; 100% of all industrial development (in or out of the Town) will be tied to the sewer system; in adjacent unincorporated territory, 75% of all new commercial development and 60% of all new residential development will be tied to Rogersville's sewer system. Given these assumptions regarding growth, the Rogersville sanitary sewer system can be expected to meet capacity in approximately 7.45 years.

Land Use		Average Annual	Captured of	Number of New Units per year	Average Estimated Additional Demand	
Urban Residential	0.417	125	1	52.125	203.15	10589.19
Rural Residential	0.685	166.25	0.6	68.32875	203.15	13880.99
Urban Commercial	0.079	125	1	9.875	300	2962.5
Rural Commercial	0.032	166.25	0.75	3.99	300	1197
Urban Industrial	0.005	125	1	0.625	500	312.5
Rural Industrial	0.003	166.25	1	0.49875	500	249.375
				Total Estimated Yearly Increase in Demand		
				Total existing capacity		217,693

Total existing capacity ÷Total Estimated Yearly Increase in Demand =
217,693÷29,191.55=
7.45 years

9.0 Wastewater Treatment Alternatives

9.0 WASTEWATER TREATMENT ALTERNATIVES

In general, when discussing wastewater treatment systems it is useful to differentiate between the method of wastewater collection and that of treatment. *Collection* is the network or system of infrastructure (e.g. sewer lines, manholes, and pumping stations) that collect wastewater from users and transmit raw sewage to a facility designed for treatment. *Treatment* refers to the infrastructure that permits the treatment, or sanitizing, of raw wastewater through one of a number (or combination of) processes. The collection and treatment alternatives described below are common alternative practices for collecting and treating wastewater from residential, commercial and industrial uses. They differ in terms of their land area requirements, environmental impact, and cost to develop and operate. Each practice is environmentally sound when its accompanying impact are considered and mitigated. The primary considerations, therefore, are the cost associated with providing the services and the development policies of the Town of Rogersville.

9.1 Collection System Alternatives

All wastewater collection systems begin at the wastewater source- the home, business or industry, which is tied to the collection system by a lateral pipe (see Figure 9.1). From there, the system consists of a network of pipes of increasingly larger size that convey wastewater to a treatment facility. Two main collection systems are readily used in wastewater treatment systems today. The first of these involves transmitting wastewater flows through gravity flow lines. Such lines are installed at a slope and diameter to allow for continuous or near continuous flow of sewage toward its destination (a treatment facility) at a rate that is not damaging to the system and does not create inadequate flow (i.e. improper scour velocity, in which case lines are not properly cleaned and eventually clog), overflowing drains, or backflow. The second alternative involves low pressure lines that are connected to pumping stations that push (or pull) wastewater along slopes that are inadequate to produce gravity flow. In both systems, the collection system must maintain a of flow rate that is not damaging to the system and does create inadequate flow (in which case lines are not properly cleaned and eventually clog), overflowing drains, or backflow.

9.1.1 Gravity Flow System

The first collection system is most conventional and consists of pipes installed underground at a slope so that the natural pull of gravity moves wastewater through them at a sufficient rate (usually 2 feet per second). Gravity flow sewers are the oldest type of collection system. In modern municipalities they are either combined with storm sewers or separate. Combined systems are found in a number of older municipalities. Newer systems are designed as separate systems due to the excessive capacity and treatment requirements of combined systems. In separate systems, wastewater is piped to treatment facilities through separate pipes. Typical pipes are made of concrete or PVC. Both must be properly installed and backfilled in order to maintain integrity. Gravity systems also include manholes positioned periodically to allow maintenance (see Figure 9.2). Where topography allows, the use of gravity flow eliminates the need for pumping stations and their associated maintenance costs. Although it is usually

Figure 9.1 Typical Sewer Service Connection

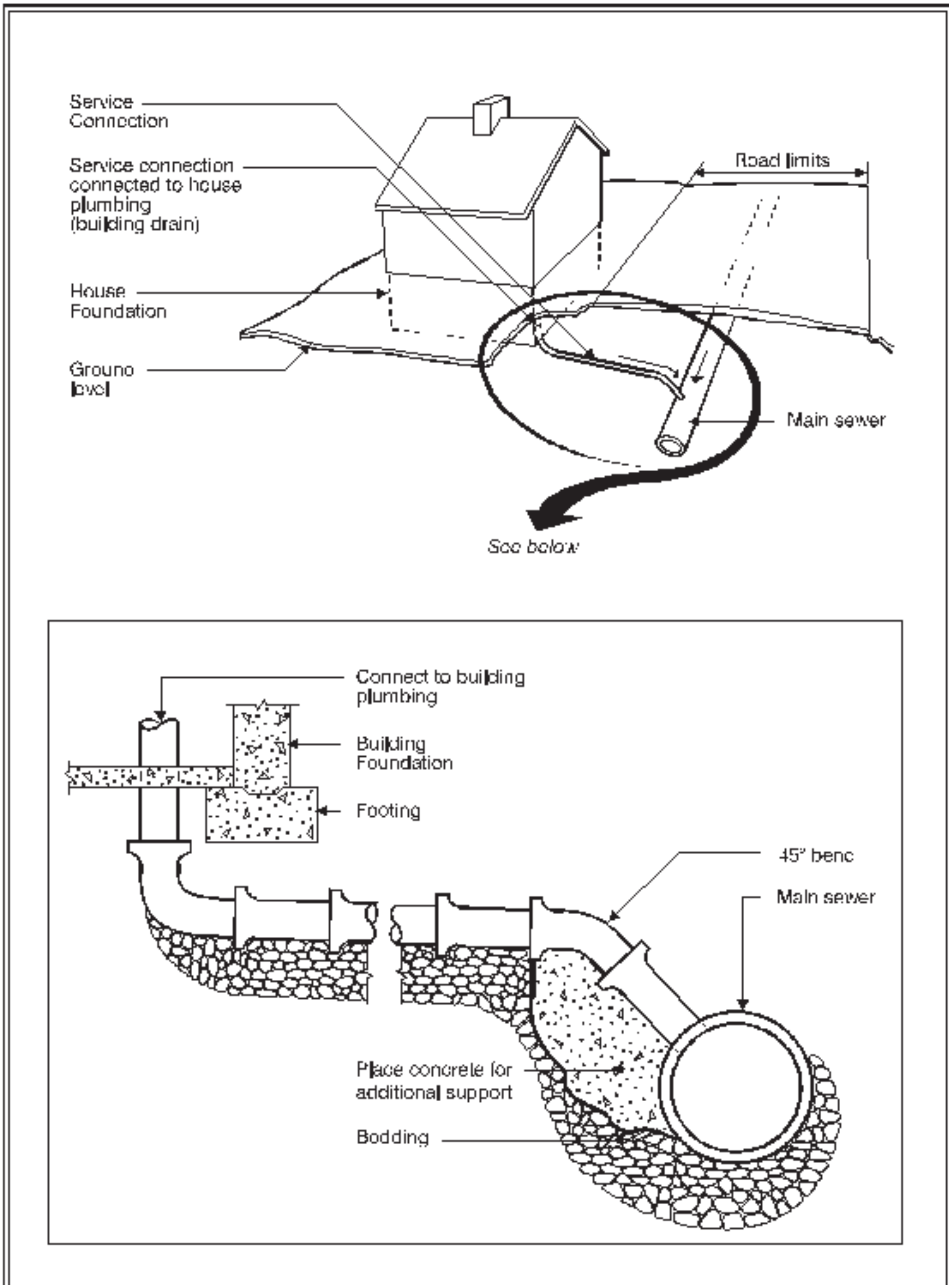
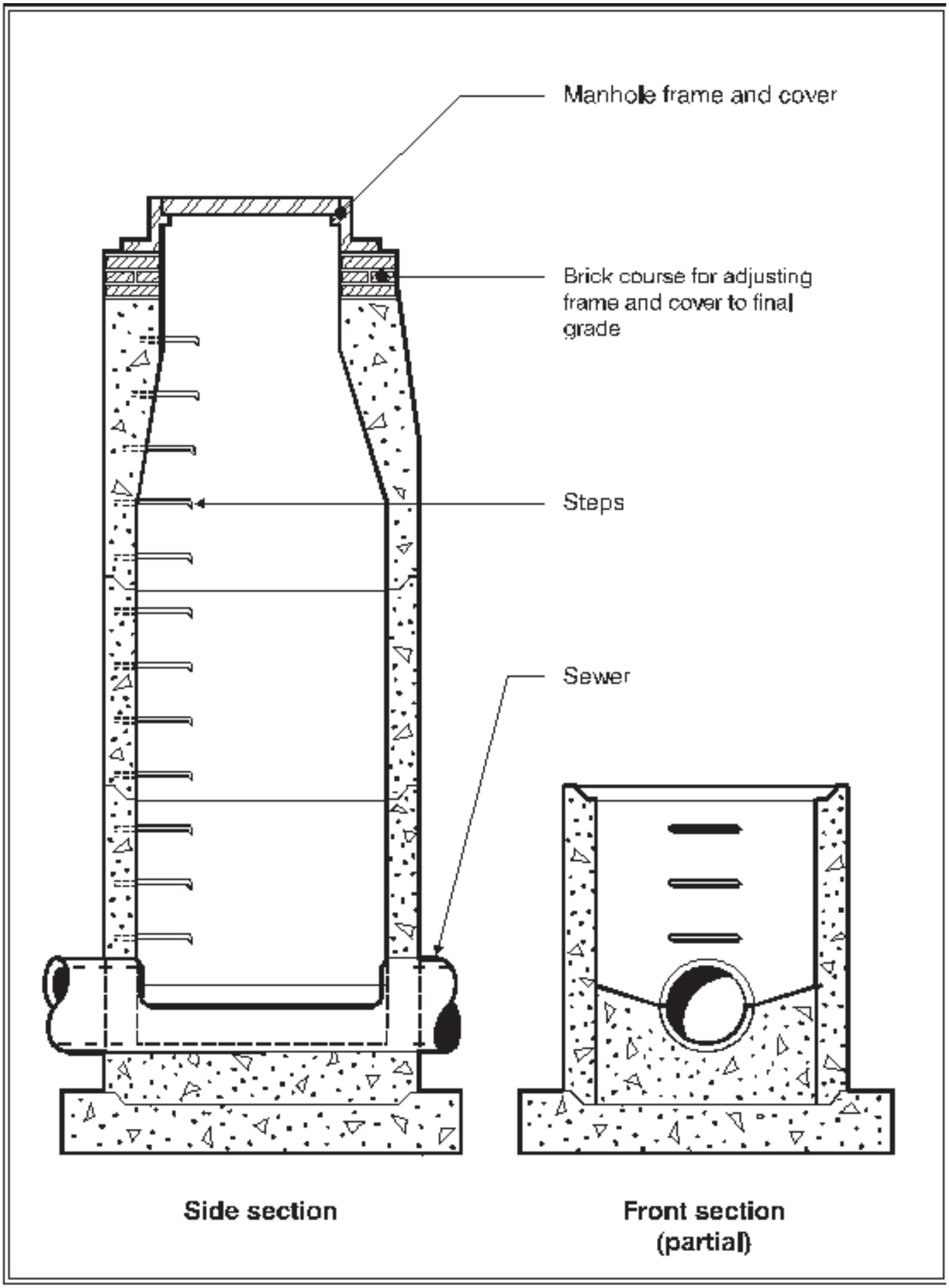


Figure 9.2 Typical Manhole



the preferred alternative, gravity flow systems are not always the most economically viable due to topography, water tables, and other site conditions.

Ideally, most designers desire a complete gravity flow system; however, due to topography, such a system is often impossible. In such cases, wastewater flows are directed via gravity lines to a well located at a low point within the basin and are pumped via a force main or pressure sewer to the next highest point. Where the second basin is not connected by a gravity flow system to a treatment facility, this wastewater, along with that generated within the second basin, are then collected and pumped. This system continues until gravity flow can be achieved. The gravity flow alternative presented below is designed for such a system.

9.1.2 Low Pressure System

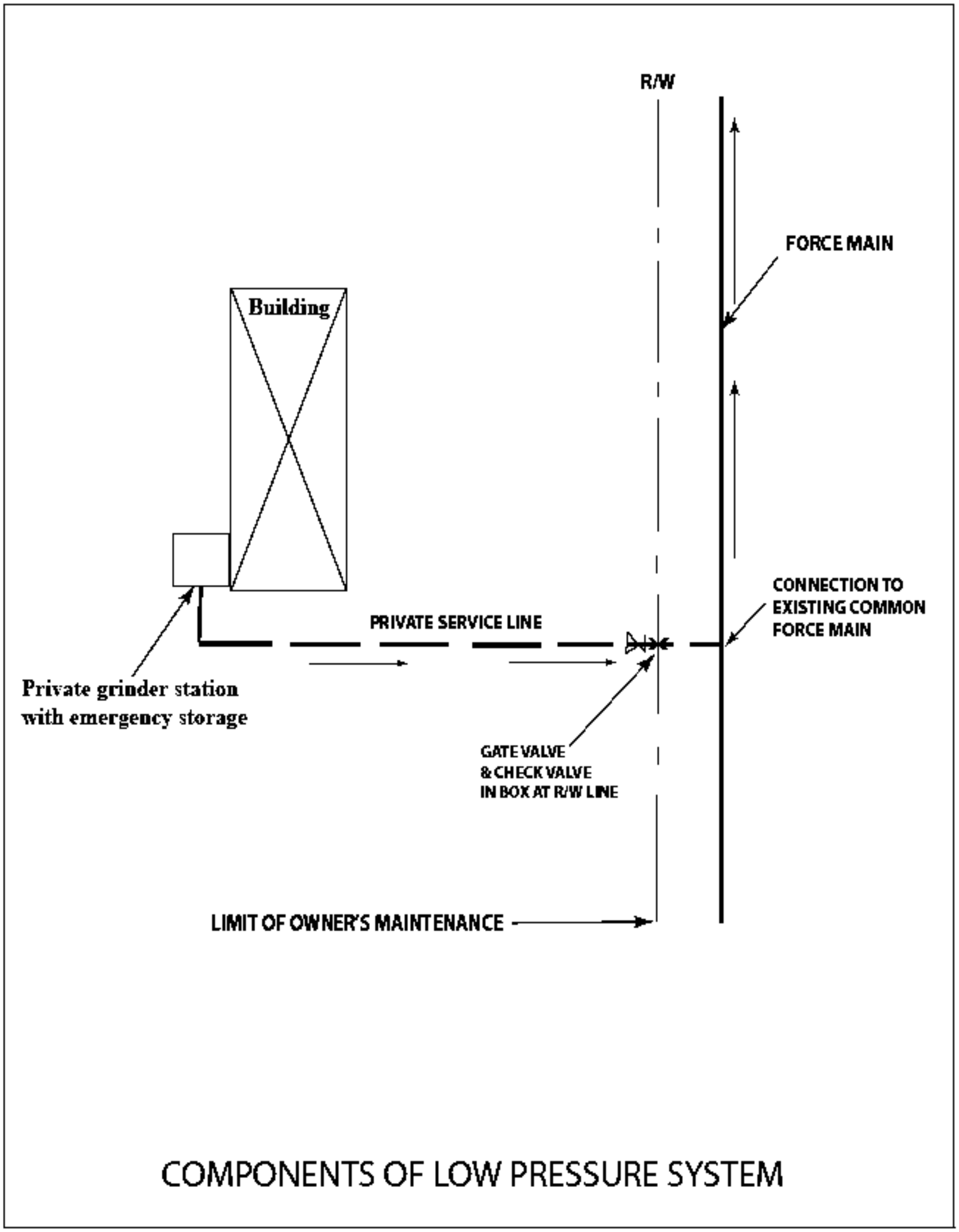
The low pressure system is the first alternative to wastewater collection. Such a system utilizes grinder pumps located at individual wastewater sources to transform solids into an effluent that is then pumped under low pressure to a lift station or treatment facility (see Figure 9.3). Screens and settling chambers are sometimes used through the system to prevent damage to mechanical parts. Since gravity flow is not required for operation, the low pressure system has the advantage of being able to follow topography without requiring as much cover, or depth underground, as is required to maintain slope and flow for gravity systems. Smaller diameter pipes are also used in low pressure systems. The pipe depth and size leads to easier maintenance. Energy consumption is comparable to gravity flow systems. Less land area is required. Additionally, these systems often have lower up-front costs to developers due to lower material costs (smaller pipes) and less site disturbance (trenching, backfilling, etc. to maintain adequate depths for gravity flow). Often, however, cost estimates often do not include the purchase of grinder pumps, which are installed (and typically maintained) by individual homeowners or businesses. When these costs are factored, the total cost of low pressure systems is clearer. Additionally, these systems have higher total maintenance and operation costs. Given the relative advantages and disadvantages of low pressure systems, their use should be considered closely for sites where conditions such as topography, depth to bedrock or water table, etc. do not allow gravity sewers.

9.1.3 Requirements and Costs

The following are estimates of system costs within the wastewater study area. Since the type and extent of development must be considered in planning for wastewater collection, costs may vary. Pipe diameters must be sufficient to allow flow, neither oversized by too great a margin nor too small. Also, since many systems use pumping stations at some point in the collection system, the size and capacity of this infrastructure should be evaluated prior to installation. Land development density is a key factor in determining these variables. The estimates presented are based on an approximate 132,000 linear feet of collection within the study area.

The projected system requirements and costs for each collection method are as follows:

Figure 9.3 Components of a Low Pressure System



Conventional Gravity System

132,000 Linear Feet 8” PVC Sewer @ $45.00	$5,940,000
440 Manholes @ $1500	$ 660,000
15 Sewage Pump Stations @ 70,000	$1,050,000
Miscellaneous Bores, etc.	$ 600,000
Total Construction	$8,250,000
Engineering Inspection, etc.	$ 825,000
Total	$9,075,000

Low Pressure System

132,000 Linear Feet 4” @ $12.00	$1,584,000
5 Sewage Pump Stations @ $70,000	$ 350,000
3600 Grinder pump Stations @ $3,000	$10,800,000
Miscellaneous Bores Etc.	$300,000
Total	$13,034,000
Engineering Inspection Etc.	$1,303,400
Total	$14,344,000

9.2 Wastewater Treatment System Alternatives

9.2.1 Expansion of the Lagoon System

The existing wastewater treatment facility at Rogersville is a two-cell stabilization pond (lagoon). This lagoon is located north of Lauderdale County Road 610, near Cooper Cemetery, southwest of the Town of Rogersville.

The pretreated wastewater from Rogersville’s lagoon is transported by a 6-inch and 8-inch parallel system of force-mains along County Road 610 to the waste stabilization ponds near the golf course at Joe Wheeler State Park. The wastewater oxidation pond at Joe Wheeler State Park is a three-cell lagoon system. The pretreated wastewater from the Rogersville stabilization ponds is mixed with the wastewater from the State Park and then the treated wastewater from both the Town and State Park is discharged to Wheeler Lake.

As stated above, the Rogersville lagoon consists of two cells having a total area of approximately 8 acres and a total volume of approximately 40 acre-feet or 13-million gallons. Hydraulically, lagoons should have about 30 days detention. Therefore, the hydraulic capacity of the Rogersville lagoon is approximately 400,000 gallons per day.

According to measurements and calculations made by the writer, the treatment capacity of the Joe Wheeler State Park lagoon system is 364,000 gallons per day. The flow from the State Park is 61,300 gallons per day, leaving a capacity for use by Rogersville of approximately 300,000 gallons per day.

As stated earlier in this report, the anticipated total sewage flow in the study area is for the design year 2025 is 776,834 gallons per day. This quantity is roughly twice the existing capacity of the Rogersville Treatment System. Therefore, the lagoons at both Rogersville and Joe Wheeler State Park will need to be roughly doubled in area and in volume.

It appears that adequate land is available adjacent to both the existing Rogersville and Joe Wheeler State Park lagoons for the expansion.

The cost estimate for expanding the two lagoons is as follows:

Clearing and grubbing 20 acres at $5000 per acre	$ 100,000	
Excavation of 150,000 cubic yards of soil at $10.00 per cubic yard	$1,500,000	
Seeding and mulching 15 acres at $1500 per acre	$ 22,500	
Piping, etc. at $50,000 lump sum	$ 50,000	
Fencing 1000 linear feet at $15.00 per linear feet	$ 15,000	
Total estimated construction cost	$1,687,500	
Engineering, inspection, etc.	$ 168,750	
TOTAL		$1,856,250

9.2.2 Packaged Plant Alternative.

An alternative to the expansion of the lagoons at Rogersville and Joe Wheeler State Park is the purchase and construction of a “packaged” wastewater treatment plant. The “packaged” wastewater treatment plant would be an activated sludge type plant.

The activated sludge process is a biological wastewater technique in which a mixture of wastewater and biological sludge (micro-organisms) is agitated and aerated. The biological solids are subsequently separated from the treated wastewater and returned to the aeration process as needed.

The activated-sludge process derives its name from the biological mass formed when air is continuously injected into the wastewater. Under such conditions, micro-organisms are mixed thoroughly with the organics under conditions that stimulate their growth through use of the organics as food. As the micro-organisms grow and are mixed by the agitation of the air, the individual organisms clump together (flocculate) to form an active mass of microbes called “activated sludge.” In practice, the wastewater flows continuously into an aeration tank where air is injected to mix the activated sludge with the wastewater and to supply the oxygen needed for the microbes to break down the organics. The mixture of activated sludge and wastewater in the aeration tank is called “mixed liquor.” The mixed liquor flows from the aeration tank to maintain a high population of microbes to permit rapid breakdown of the organics. Because more activated sludge is produced than can be used in the process, some of the return sludge is diverted or “wasted” to the sludge-handling system for treatment and disposal. In conventional activated-sludge systems, the wastewater is typically aerated for 6-8 hours in long, rectangular aeration basins with about 1 cubic foot of air injected uniformly along the length of the aeration basin for each gallon of wastewater treated. Air is introduced either by injecting it into diffusers near the bottom of the aeration tank or by mechanical mixers located at the surface of the aeration tank. The volume of sludge returned to the aeration basin is typically 20-30 percent of the wastewater flow. There are many variations of the conventional system that have evolved over the years and that have improved the process performance.

Many small activated-sludge plants, often sold as prefabricated steel package plants, use the *extended aeration* form of activated sludge. The process flow diagram is essentially the same as larger conventional complete mix type plants except that these small plants typically have no primary treatment and aerate the raw wastewater for a 24-hour period rather than the 6-8 hours used in conventional plants. The long aeration period allows the activated sludge formed to be partially digested within the aeration tank so that it can be dewatered and disposed of without the need for large sludge digestion capacity.

The estimated cost for this package plant alternative is as follows:

750,000 gallon per day package wastewater treatment plant at $3,375,000	$3,375,000	
Site preparation, grading, slab at $100,000	$ 100,000	
Fence at $10,000	$ 10,000	
Lab and operator’s building 1500 SF at $150 per SF	$ 225,000	
Miscellaneous equipment	$ 100,000	
Total estimated construction cost	$3,810,000	
Engineering, Inspection, etc.	$ 381,000	
TOTAL		$4,191,000

9.4 Selected Alternatives

It is recommended that the gravity sewer alternative for sewage collection be adopted. This alternative appears to have a higher initial cost than that of gravity collection. However, the majority of the low-pressure alternative's cost is for the grinder pump units that are required for each residence or commercial unit. While these grinder pump costs are typically paid directly by the builder/developer when a new unit is constructed, their combined purchase, installation and maintenance costs are higher. While the environmental impact is less for the low-pressure alternative due to the comparative depths and sizes of the mains, long term operation and maintenance considerations favor the extension of gravity sewers through most areas. Low pressure collection alternatives will be considered when slope, topography or other considerations, lead to high barriers to development in an particular development.

It is recommended that the alternative for expanding the existing lagoons be adopted rather than the packaged plant alternative. The lagoon system will, it is expected, have a much lower initial cost, a lower operation and maintenance cost and be less susceptible to operational upsets than the packaged plant.

10.0 Implementaion and Potential Funding Sources

10.0 IMPLEMENTATION AND POTENTIAL FUNDING SOURCES

The expansion of the Rogersville will be accomplished primarily through private investment and external funding sources. The expansion of the system based on current system revenues would be cost prohibitive. Revenues received from growth and development accompanying sanitary sewer expansion can be expected to provide for operation and maintenance, including capital depreciation; however, initial capital investment costs are beyond the revenue capacity of the system or the Town of Rogersville. The system and Town must, therefore, seek external sources of funding to finance construction of the system.

10.1 Private Investment

The majority of the system expansion will necessarily be financed by private investment, incrementally in the course of land development. As property is taken from its natural state to accommodate the additional demand for housing and commercial and industrial development, the Town's development policies, particularly its subdivision regulations, will regulate the installation of sanitary sewers. These regulations must be sufficient to ensure that the sewer service is adequate for the town and surrounding territory.

10.2 Grant Opportunities

A number of sources of external funding are available for investments in community wastewater facilities. Each program has its particular focus area and can be a source of support for implementing the expansion of wastewater services for a given project or area within the study area, depending upon the goals to be met by such an expansion. The following is a list of several of these sources and their main focal points:

<u>USDA Rural Development</u>

Funds are available to public bodies and nonprofit corporations to develop water and waste disposal systems, including solid waste disposal and storm drainage, in rural areas and towns with a population not in excess of 10,000. To qualify, applicants must be unable to obtain the financing from other sources and/or their own resources at rates and terms they can afford.

<u>Community Development Block Grants Program</u>

The State of Alabama currently participates in the state-administered Community Development Block Grant (CDBG) Program. This program is funded by the U.S. Department of Housing and Urban Development and is administered in Alabama by the Alabama Department of Economic and Community Affairs (ADECA). CDBG funds are available under four programs, or funds: Competitive Fund, Planning Fund, Economic Development Fund, and Enhancement Fund. Wastewater projects qualify most frequently through Competitive applications, but can be considered for economic development funds, including both grants 9with a 20% match) and loans.

<u>Environmental Protection Agency State and Tribal Assistance Grant Program (EPA STAG)</u>

STAG funds are used to build and enhance the capacity of states and tribes to carry out compliance assurance activities within their respective jurisdictions. The projects selected cover a wide range of activities that have and will continue to enable states and tribes to demonstrate compliance assurance and enforcement outcomes from their activities while serving as models for other states and tribes. These capacity building activities include training, studies, surveys and investigations.

<u>Appalachian Regional Commission</u>

The Appalachian Regional Commission was established in 1965 to improve the economic conditions of Appalachian counties in 13 states, including Lauderdale County, Alabama. ARC funds are available under one of four broad goals. Wastewater improvements fall under ARC Goal 3: Develop and improve Appalachia's infrastructure to make the Region economically competitive. Grants are available for up to $200,000 per project based upon the attainment status of the county. Lauderdale County is considered "Transitional" and is required to provide 50% matching funds.

<u>Economic Development Administration</u>

EDA provides grants for utilities and infrastructure improvements in order to promote higher skill and higher wage jobs in an area suffering from economic dislocation. EDA funds are intended to leverage additional private investment through assistance to projects with broad regional and innovative foundations. Generally, EDA funds may not exceed 50% of the total project cost (50% non-federal match requirement).

10.3 Timeline for Implementation

The timeline for implementing the recommendations of this plan depends upon the rate of growth and development in and around the Town of Rogersville and the demand for development at densities available only with centralized sewer services. The moderate-to-high growth projections and projections based upon current development patterns demonstrate that, under certain assumptions, the Rogersville sewer system has a strong potential to reach capacity within a short period of time (less than ten years). Although exact rates of development and exact patterns of development are impossible to predict with high degrees of accuracy, the presence of strong development pressures in the Rogersville area is clear. Also clear is the likely escalation of these pressures in coming month and years as the result of various regional developments such as the U.S. Department of Defense's Base Realignment and Closure program and successful economic development initiatives. In order to meet these challenges, sewer treatment capacity should be increased by 15% within 5 years (2013) and by an additional 10% in 10 years (2018). This would accommodate up to one quarter of the growth predicted by recent population trends. Such a moderate approach to improvements will allow the town to observe development trends and gauge the need for more rapid expansion of the system. Meanwhile, collection system capacity should be increased as required to meet the needs of development under clear guidelines.

[1] Census 2000.

[2] Climate data available from the National Weather Service on the Internet at http://www.srh.noaa.gov/hun/climate/mslcli.php. Nearest data are from Muscle Shoals Regional Airport.

[3] Soil Survey of Lauderdale County, Alabama. United States Department of Agriculture Soil Conservation Service, Alabama Department of Agriculture and Industries, Alabama Agricultural Experiment Station. June 1977.

[4] This map is for illustrative purposes and approximating the location and extent of development restrictions only. Development conditions must be determined by appropriate means prior to site development.

[5] For unincorporated areas, see Flood Insurance Rate Map, Lauderdale County, Alabama, Community Number 010323, Panel Number 0225B, February 4, 1981. For the Town of Rogersville, see Flood Hazard Boundary Map, Community Number 010339A, Map Number H-01.

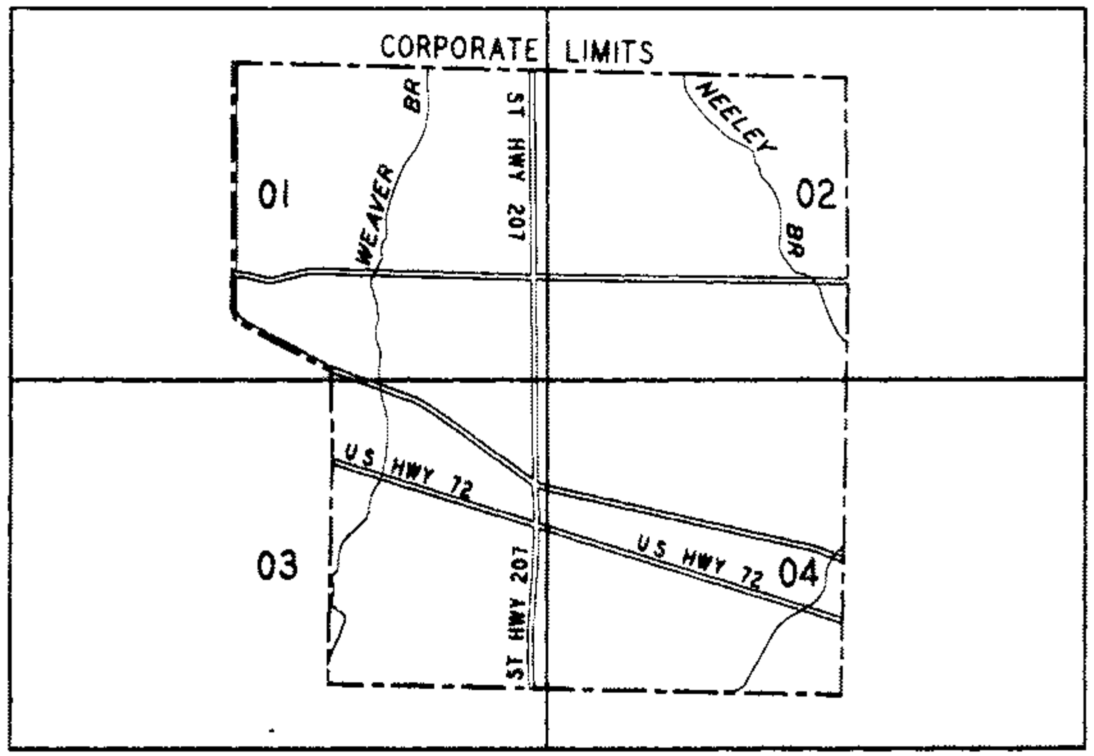
[6] See EPA Air Quality Index Report. http://iaspub.epa.gov/airsdata/adaqs.aqi?geotype=co&geocode=01033&geoinfo=%3Fco%7E01033%7EColbert+Co%2C+Alabama&year=2006+2005+2004+2003+2002+2001+2000+1999+1998+1997+1996&sumtype=co&fld=gname&fld=gcode&fld=stabbr&fld=regn&rpp=25

[7] In 1990, the population of the study area was approximately 3050 , or 3.83% of the Lauderdale County population of 79661. In 2000, the population of the study area was approximately 3988 , or 4.53% of the Lauderdale County population of 87966.

[8] Source: 2006 Employment Data, INFOUSA. Commercial data system based on telephone census.

[9] Efforts to retain prime agricultural property is an additional considerations for the Town, which has not been discussed to date.

Appendix:



DEPARTMENT OF HOUSING AND URBAN DEV
Federal Insurance Administration

FLOOD HAZARD BOUNDARY MAP H

MAP INDEX

TOWN OF ROGERSVILLE, A
(LAUDERDALE CO.)

COMMUNITY NO. 010339/

ELOPMENT

01-04