3. AFFECTED ENVIRONMENT

3.1 GEOLOGY AND SOILS

Physiographic Setting

The project area is within the Gulf Coastal Plain physiographic province, mainly on the eastern flank of the Mississippi embayment (Cushing revegetation. 1964, USDA 1979). The area is characterized by low hills, low steep-sided ridges, and gently rolling lowlands. In general, fine-grained strata of clay, chalk, and mudstone underlie the low-lying areas; and coarse sand and gravel underlie low ridges and hills. Most of the ridge tops are mantled by silty materials ranging in thickness from a few inches to several feet.

3.1.1 Geology

Stratigraphy

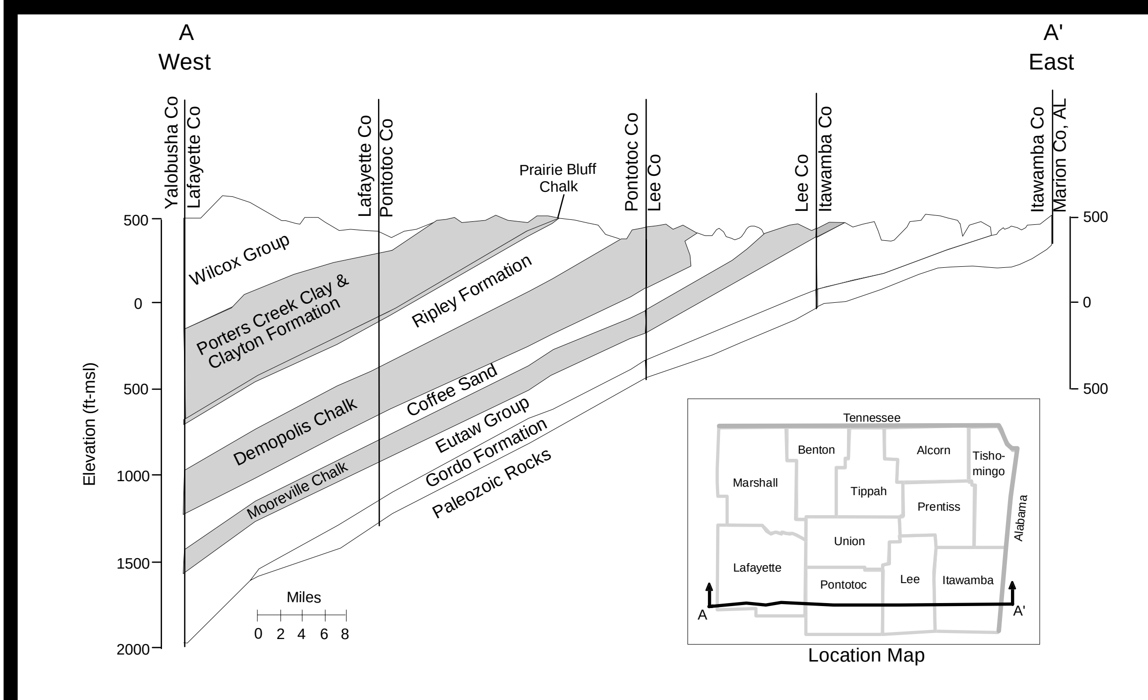
The Mississippi embayment is a southward plunging geosyncline comprised of a thick sequence of marine, deltaic, and fluvial sediments which range in age from Cretaceous to Quaternary. These sediments generally consists of gravel, sand, silt, clay, marl, chalk, and limestone. The major regional stratigraphic units associated with these sediments are given in Table 3.1-1 and are shown in the generalized section on Figure 3.1-1. The sedimentary units generally dip and thicken to the south (toward the Gulf of Mexico) and toward the axis of the embayment, averaging about 40 ft/mi (Boswell et al., 1965). The general gulfward thickening is interrupted by uplifts, domes, anticlines, basins, synclines, and faults of subregional size. The embayment axis is closely aligned with the present-day location of the Mississippi River. Except where they are covered by alluvial deposits of the ancestral Mississippi River, sedimentary rocks of Cretaceous to early Tertiary age outcrop mostly in off-lapping bands that parallel the perimeter of the embayment. The Cretaceous deposits in the northern portion of the Mississippi embayment, including the site area, constitute the major aquifers of the region and overlie older Paleozoic rocks consisting of limestone, shale, chert, and sandstone.

Lower elevations (i.e., stream valley) of the proposed multi-purpose reservoir site are underlain by hard sandy limestone of the Ripley formation. The Ripley formation is highly fossiliferous and exhibits karst features in certain portions of Union County. Higher elevation areas surrounding the proposed reservoir site are primarily composed of the Clayton formation and underlying Owl Creek formation. The Owl Creek formation merges into the Prairie Bluff chalk near the southern portion of the site. The contact of the Prairie Bluff chalk and Ripley formation is exposed on the westward-facing steep slope of the Cane Creek valley. The Clayton formation generally consists of fine sandy clay that grades downward into highly glauconitic medium-grained sand. The Owl Creek

Table 3.1-1 Geologic Units and Principal Aquifers in the Region (modified from Slack and Darden, 1991; Jennings, 1994)

Era	System	Series	Group	Geologic Unit	Principal Aquifer or Aquifer System	
Cenozoic	Tertiary	Eocene	Wilcox	Hatchetigbee Formation Tuscahoma Formation Wilcox Group, middle part Nanafalia Formation Wilcox Group, lower part	*Lower Wilcox aquifer*	
		Paleocene	Midway	Naheola Formation Porters Creek Clay Clayton Formation		
Mesozoic	Cretaceous	Upper Cretaceous	Selma	Prairie Bluff Chalk and Owl Creek Formation Ripley Formation Demopolis Chalk Coffee Sand Mooreville Chalk	Ripley aquifer Coffee Sand aquifer	
			Eutaw	Eutaw Formation Tombigbee Sand Member Lower Eutaw Formation McShan Formation	Eutaw-McShan aquifer	
			Tuscaloosa	Gordo Formation Coker Formation Massive sand	Gordo aquifer Coker aquifer Massive sand aquifer	Tuscaloosa aquifer system
		Lower Cretaceous		Undifferentiated	Lower Cretaceous aquifer	
Paleozoic	Mississippian			Tuscumbia Formation Fort Payne Formation	Iowa aquifer	Paleozoic aquifer system
	Devonian			Chattanooga Shale		
				Harriman Formation Flat Gap Limestone Ross Formation	Devonian aquifer	

Figure 3.1-1 Major Stratigraphic Units (adapted from Newcome, 1974; Wasson and Tharpe, 1974; and Gandl, 1982)



formation is highly fossiliferous and consists of argillaceous, glauconitic fine sand and sandy clay that is calcareous in places. The Prairie Bluff chalk is represented in Union County by chalky sand and calcareous clay that contain numerous fossils (Stephenson and Monroe, 1940).

3.1.2 Soils

Soils in the project area are formed from varying combinations of loess, marine deposits, and alluvial parent materials. Where the underlying material of loess is thin, the upper soil horizons formed in weathered loess and the lower soil horizons formed in acid marine deposits. Atwood and Providence soils formed in this combination of parent materials. The parent materials in the steeper areas are of marine origin. The particles of these sediments are mixtures of sand, silt, and clay. Smithdale soils formed in this kind of material. Soils along the streams formed in alluvium washed from the surrounding uplands and redeposited by streams on the flood plains. The alluvium particles are predominantly silt mixed with sand and clay. Cascilla and Jena soils are examples.

The dominant soil series in Union County is Smithdale, which occupies about 40 percent of the county and is classified as a fine-loamy, siliceous, thermic Typic Paleudults. This soil is acidic with moderate permeability, rapid runoff potential, and severe erosion hazard. Because of the steep slopes and the erosion hazard, this soil is not suitable for crops (USDA 1979).

About 39 percent of Union County is classified as having prime farmland soils. Prime farmland is described in more detail in Section 3.10.

<u>Proposed Multipurpose Reservoir</u>

Reservoir Site - The various soils occurring in the proposed reservoir area, considered here to be the area within 500 ft of the flood pool, are listed in Table 3.1-2. The most widespread are the Smithdale series and its associations, and the Jena silt loam, each of which occupy about a quarter of the area. The Smithdale is acidic with moderate permeability, rapid runoff potential, and severe erosion hazard. Because of the steep slopes and the erosion hazard, this soil is not suitable for crops. Forestland and some pastureland cover the area occupied by these soils. Jena silt loam soil is a coarse-loamy, siliceous, thermic Fluventic Dystrochrepts. This well-drained, acidic soil is located on the floodplain of Cane Creek and has moderate permeability and slow runoff potential. This soil has been cleared and used for crops or pasture.

The Providence soil series occupies about 15 percent of the area. This soil is classified as a fine-silty, mixed, thermic Typic Fragiudalfs and is medium acid to very strongly acid. Permeability is moderate in the upper part but moderately slow in the fragipan. Run-off is medium, and the erosion hazard is medium. Mantachie silt loam covers about 14 percent of the area and is classified as a fine-loamy, siliceous, acid, thermic Aeric Fluvaquents. This somewhat poorly drained,

Table 3.1-2 Soils Which Occur on the Union County Mississippi Reservoir Water Supply Project Site With Respective Acreage				
Map Unit and Description*	**Map Symbol**	**Occurrence**		**Hydric Soil**
		Acres	**%**	
Arkabutla silt loam, 0-2 % slope, somewhat poorly drained	Ar	1.2	0.1	YES[1]
Atwood silt loam, 2-5 % slope, well-drained	AtB2	54.7	2.4	NO
Atwood silt loam, 5-8 % slope, well-drained	AtC2	76.2	3.3	NO
Atwood silt loam, 8-12 % slope, well-drained	AtD3	75.1	3.2	NO
Bude silt loam, 0-2 % slope, somewhat poorly drained	Bu	37.8	1.6	YES[2]
Cascilla silt loam, 0-2 % slope, well-drained	Ca	150.8	6.5	YES[1]
Jena silt loam, 0-2 % slope, well-drained	Je	614.2	26.5	YES[1]
Mantachie silt loam, 0-2 % slope, somewhat poorly drained	Ma	318.2	13.7	YES[1]
Oktibbeha-Sweatman-Smithdale complex, 12-20 % slope	OmE2	45.5	2.0	NO
Ora fine sandy loam, 8-12 % slope, moderately well-drained	OrD3	8.3	0.4	NO
Providence silt loam, 2-5 % slope, moderately well-drained	PrB2	107.3	4.6	NO
Providence silt loam, 5-8 % slope, moderately well-drained	PrC2	229.6	9.9	NO
Providence silt loam, 8-12 % slope, moderately well-drained	PrD3	9.1	0.4	NO
Smithdale sandy loam, 17-35 % slope, well-drained	SdF	208.0	9.0	NO
Smithdale - Udorthents complex, 5-35 % slope, gullied	SgF	155.1	6.7	NO
Smithdale - Sweatman association, 12-40 % slope, hilly	STF	221.0	9.5	YES[2]
Talla silt loam, 0-2 % slope, somewhat poorly drained	Ta	2.7	0.1	NO
TOTALS		**2314.8**	**100.0**	

*Source: USDA-SCS, 1979. Soil Survey of Union County, Mississippi
[1]On the National, State, and Union County hydric soil lists (NRCS 1996).
[2]On the Union County, MS, hydric soil list but not on the National or State lists.

acidic soil is found on the tributary floodplains. Permeability is moderate and available water capacity is high. Run-off is slow, and water tends to pond in low areas.

Remaining soils cover less than 10 percent of the area. The Atwood series is a well-drained soil and is classified as a fine-silty, mixed, thermic Typic Paleudalfs. Cascilla silt loam is a well-drained, fine-silty, mixed, thermic Fluventic Dystrochrepts located on the floodplain of Cane Creek. With a slow run-off potential and slight erosion hazard, this soil has a high potential for most locally grown row crops. The moisture range for tillage is relatively wide. The remaining soil series are the Arkabutla, Bude, and Talla silt loams and Ora fine sandy loam.

The Arkabutla, Atwood, Bude, Cascilla, Jena, Mantachie, and Providence soils on slopes of less than 5 percent are prime farmland soils (USDA-SCS 1979). The

Atwood and Providence soils with 5 to 8 percent slope are classified as local important land. Prime farmland is further discussed in Section 3.10.

Many soil properties and site features affect water management practices. Soils best suited for reservoir areas have a low seepage potential, which is largely determined by permeability and the depth to fractured or permeable bedrock or other permeable material (Table 3.1-3). Two soil series in the proposed reservoir area have high permeability rates. The Smithdale soil series has a permeability rate of 2 to 6 inches per hour in the upper 4 inches of the profile and also in the lower profile from 25 to 76 inches deep. The permeability rate of Jena silt loam is 2 to 6 inches at the depth of 21 to 60 inches (USDA-SCS 1979).

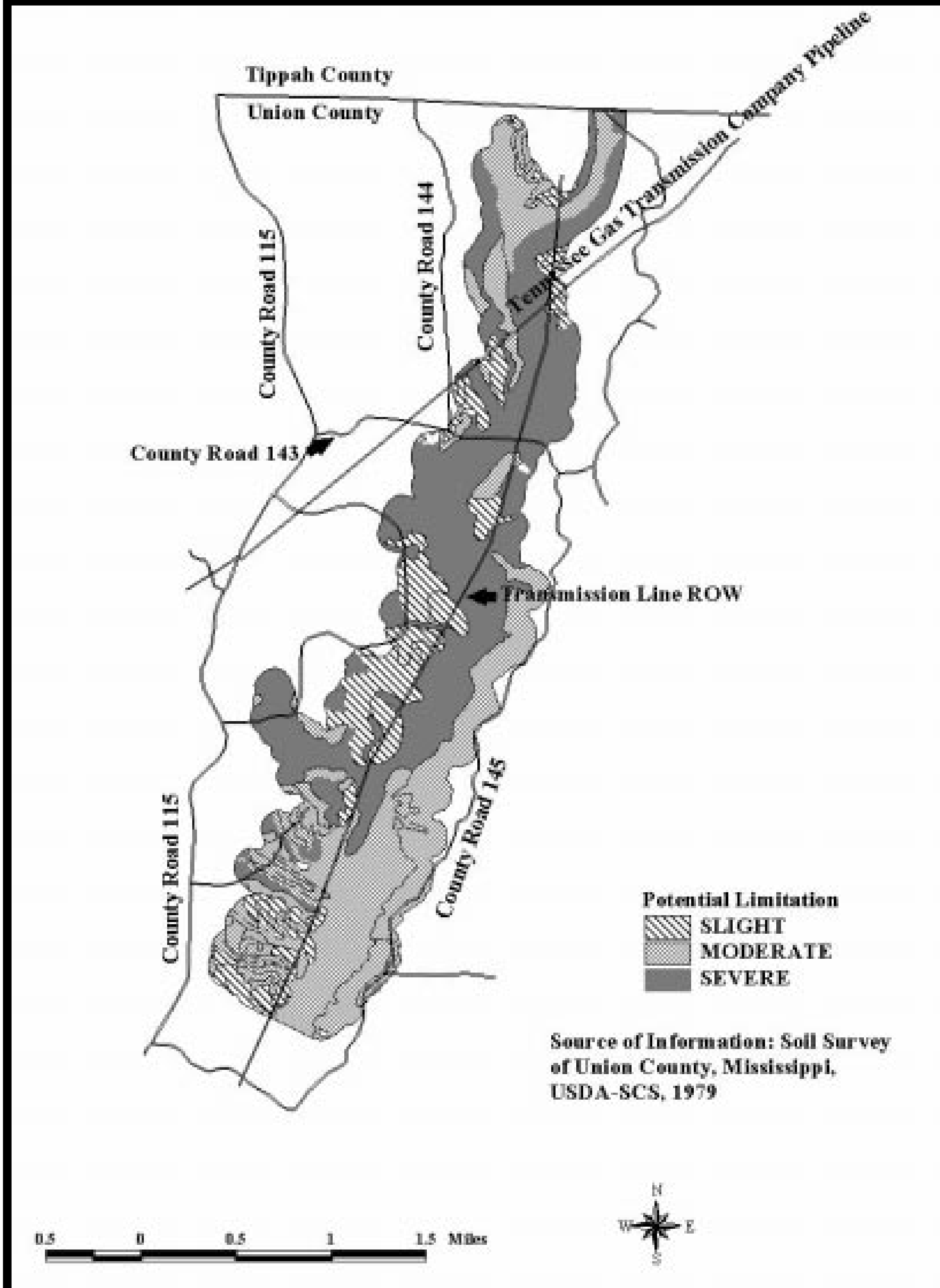
In Figure 3.1-2, soils in the proposed reservoir area are classified according to their degree of potential limitation for reservoir development. Slight means that the soil properties and site features are generally favorable and any limitation is minor and easily overcome. Moderate means that some soil properties or site features are unfavorable but can be overcome or modified by special planning and design. Severe means that the soil properties are so unfavorable and so difficult to

Table 3.1-3 Depth and Permeability Rate of Soils in the Union County Mississippi Reservoir Water Supply Project Site

Soil Series*	Depth	Permeability
	Inches	Inches/Hour
Arkabutla	0-55	0.6-2.0
Atwood	0-87	0.6-2.0
Bude	0-28	0.6-2.0
	28-60	0.06-0.2
Cascilla	0-72	0.6-2.0
Jena	0-21	0.6-2.0
	21-60	2.0-6.0
Mantachie	0-60	0.6-2.0
Oktibbeha	0-6	0.6-2.0
	6-60	<0.06
Ora	0-2	2.0-6.0
	2-22	0.6-2.0
	22-52	0.2-0.6
	52-64	0.6-2.0
Providence	0-18	0.6-2.0
	18-52	0.2-0.6
	52-62	0.6-2.0
Smithdale	0-4	2.0-6.0
	4-25	0.6-2.0
	25-76	2.0-6.0
Sweatman	0-7	0.6-2.0
	7-57	0.2-0.6
Talla silt loam	0-6	0.6-2.0
	6-79	0.2-0.6

*Source: USDA-SCS, 1979. Soil Survey of Union County, Mississippi

Figure 3.1-2 Location of Soils with Potential Limitation for Reservoir Development



correct or overcome that major soil reclamation, special design, or intensive maintenance is required (USDA-SCS 1979). There are 387 acres (17 percent) with potential for slight limitations, 951 acres (41 percent) with potential for moderate limitations, and 977 acres (42 percent) with potential for severe limitations. The soils with moderate and severe limitations have a high seepage potential. Seepage is defined as the rapid movement of water through the soil.

Another physical property of soils potentially affecting engineering uses is the shrink-swell potential (Appendix C- 1, Table C-1.1), a function of the amount and type of clay in the soil. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. Most of the soils in the project area have low or moderate potential. Therefore, there should be minimal or no limitation for use of the soils in the project area as foundation material.

All of the soils in the county have severe limitations for septic tanks absorption fields with the exception of Atwood (USDA-SCS 1979). Properties which affect absorption of effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility of flooding. Special designs such as installation of a system to lower the seasonal water table or increasing the size of the absorption field can increase performance so that absorption is satisfactory.

Erosion potential is another factor which affects engineering uses. Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. Generally a K value of less than 0.23 is considered low erodibility, 0.23- 0.36 moderate erodibility, and 0.36 and above as high erodibility (Virginia Department of Conservation and Recreation 1992). Atwood, Bude, Providence, and Talla soils have a high erodibility potential (Appendix C-1). Oktibbeha, Ora, and Smithdale soils have a moderate erodibility potential. Arkabutla, Cascilla, Jena, and Mantachie soils are located on the level floodplains and do not have K factors. The T factor is the soil-loss tolerance factor, and is the maximum rate of soil erosion than can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Water Treatment Facility and Pipeline—The proposed water treatment plant is immediately southwest of the proposed dam. Providence silt loam soil occupies about 36 percent of this 30-acre site, Atwood silt loam occupies about 30 percent, severely eroded Atwood occupies 28 percent, and bude silt loam is on the remaining 6 percent.

The pipeline from the treatment plant to New Albany would follow Cane Creek to CR 137, run adjacent to the northern ROW of CR 137, cross CR 115 and State Highway 15, run along the western ROW of State Highway 15 to Barkley Road, run adjacent to the northern ROW of Barkley Road to Moss Hill Road, and run along the western ROW of Moss Hill Road to the water tower at Fairground Circle. Soils which occur within this ROW are: Atwood, Mantachie, Pooleville, and Providence silt loams, and Smithdale sandy loam. All these soils are classified as prime farmland or local important farmland with the exception of

Smithdale, which occupies about 5 percent of the corridor. Atwood and Providence soils have characteristics indicative of a high erosion potential.

Transmission Line Routes—The soils in the two proposed alternate routes for the relocated 161-kV transmission were identified and measured. Alternative route 1 would traverse about 78 acres. Soils in this ROW classified as prime farmland are of the Cascilla, Jena, Mantachie, and Providence soil series and cover about 27 acres. Atwood silt loam soils with slopes from 5 to 12 percent, Talla silt loam, and Smithdale associations comprise the remainder of the route. There are 17 acres of local important farmland. The Providence, Talla, and Atwood soils are classified as highly erosive.

The proposed corridor for Alternative route 2 crosses about 91 acres and contains about 36 acres of soils classified as prime farmland and 14 acres of local important farmland. The prime farmland soils are in the Cascilla, Jena, Mantachie, and Providence soil series with slopes less than 5 percent. Other soils in this corridor are Atwood silt loams with slopes from 5 to 12 percent, Talla silt loam, and Smithdale associations. The Providence, Talla, and Atwood soils are classified as highly erosive.

<u>Pipeline from Existing Water Supply</u>

Transmission of water from the NEMRWSD at Tupelo to New Albany is the third alternative. The approximately 27-mile long water pipeline would run adjacent to the northeastern ROW of U. S. Highway 78 to connect to New Albany's water supply. Soils in this proposed corridor are Cascilla, Chenneby, Mantachie, Providence, and Prentiss. Prime farmland soils occupy about 62 percent of this ROW (EPA 1994). Providence silt loam is highly erosive.

<u>Additional Groundwater Sources</u>

Under this alternative, new groundwater sources would be developed. Also, construction of water treatment facilities and pipelines connecting the new wells to existing distribution systems would be necessary. Characterization of affected soils is not possible until the sites of wells and other facilities are known.

3.2 GROUNDWATER

3.2.1 Regional Hydrogeologic Setting

Most aquifers in the Mississippi embayment contain freshwater well downgradient of their outcrop. The aquifer units are comprised predominantly of poorly consolidated to unconsolidated clastic sediments. The distribution and pattern of permeability within the different aquifer system strata are a function of lithology and primary porosity. In general, the most permeable aquifers consist of sand and some gravel and are separated by silt, clay, marl, or chalk confining units. As these aquifers extend down-dip, most grade to less permeable facies, such as clay or marl, that are part of adjoining confining units.

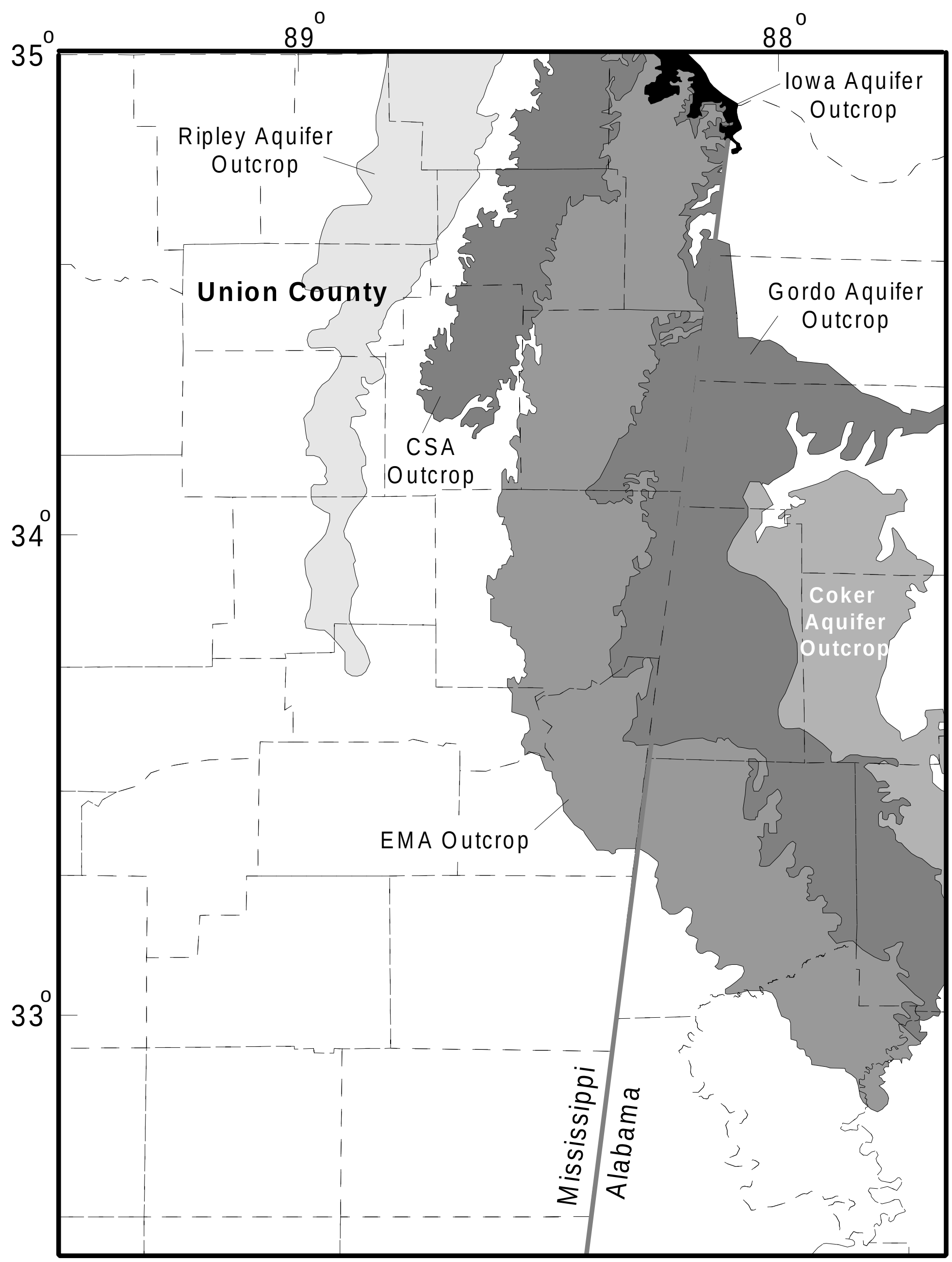
The principal aquifers in the site region are (in descending order): Lower Wilcox, Ripley, Coffee Sand, Eutaw-McShan, Gordo, Coker, Massive Sand, Lower Cretaceous, and Paleozoic system. The Tuscaloosa aquifer system includes the group of aquifers below the Eutaw-McShan and above the Paleozoic system. The stratigraphic order of the regional aquifers is indicated in Table 3.1-1 and Figure 3.1-1. Figure 3.2-1 depicts outcrop areas of regional aquifers, and their hydraulic characteristics are summarized in Table 3.2-1.

The Lower Wilcox aquifer (LWA) is a freshwater aquifer of major importance in the region, but is only present along the extreme western border of Union County. The aquifer generally consists of lenticular deposits of poorly sorted, fine- to medium-grained sand. From its outcrop, the LWA dips west-southwest at 30 to 35 ft/mi. The aquifer ranges up to 250 ft in thickness regionally, but sand thickness is variable and may be absent in some areas. The LWA is recharged by precipitation in the outcrop area from which groundwater movement is generally westward. As with most aquifers of the Mississippi embayment, groundwater quality in the LWA tends to deteriorate down-dip.

The Ripley Formation crops out in western Alcorn and northwestern Prentiss County, and eastern Union, Tippah, and Pontotoc Counties. The upper part of the formation contains the most significant water-bearing member, the McNairy Sand. The sand grades to silt and clay in northeastern LaFayette County. In many places, the sand unit is more than 50-ft thick and in a few places more than 100-ft thick. In Union County, the unit is also characterized by numerous thin sand beds. The Ripley receives recharge from precipitation in its outcrop, and direction of water movement is toward the southwest. According to Newcome (1974) the down-dip limit of fresh water in the Ripley is less than 20 miles southwest of Union County.

The Coffee Sand aquifer (CSA) crops out predominantly in northeastern Mississippi and in central Tennessee. Although outcrops of the aquifer occur as far north as southern Illinois, the aquifer in Mississippi appears to be a continuous unit (Hutson et al., 2000). The CSA is generally composed of fine to medium quartz sand that is calcareous and glauconitic, with lenses of silty sand and clay (Boswell, 1963). In the southern part of Pontotoc and Lafayette Counties, the aquifer is limited by a lateral facies change where the sand grades into the Mooreville Chalk (Mellen, 1958). The total sand thickness of the CSA within the region ranges from about one foot in the eastern part of the outcrop area to more than 200 ft in the western part of the region (Panola County). From its outcrop, the aquifer dips about 35 ft/mi westward (Boswell et al., 1965). The CSA receives the majority of recharge from precipitation in the outcrop area. The concentration of dissolved solids increases in the down-dip direction to the west. Newcome (1974) and Strom (1998) indicate that the down-dip limit of fresh water in the CSA coincides with the western boundary of Lafayette County.

Figure 3.2-1 Outcrops of Regional Aquifers (adapted from Strom and Mallory, 1995; Strom, 1998; and Hutson, et al., 2000)



Sands of the Eutaw and McShan formations constitute the EMA since sands of the two units are hydraulically connected in Mississippi. However, intervening beds of clay and silt may result in localized vertical hydraulic gradients. The upper part of the EMA, the Tombigbee Sand Member, has a finer grain size and a larger silt

Table 3.2-1 Hydraulic Characteristics of Regional Aquifers

Aquifer or System	Transmissivity (ft^2/d)			Well Yield (gpm)			Source
	median	min	max	median	min	max	
Lower Wilcox	5,100	100	36,000	230	20	2,180	Slack and Darden, 1991
	5,300	670	51,000	---	---	2,000	Gandl, 1982
	---	---	---	---	50	150	Newcome, 1974
Ripley	270	65	800	112	30	210	Slack and Darden, 1991
	---	270	800	---	50	450	Newcome, 1974
Coffee Sand	930	800	1,500	250	20	300	Slack and Darden, 1991
	---	930	1,200	---	50	560	Newcome, 1974
Eutaw-McShan	1,000	20	6,000	160	5	700	Slack and Darden, 1991
	---	200	4,900	---	---	770	Gandl, 1982
	---	930	2,140	---	60	550	Newcome, 1974
Tuscaloosa System	3,400	130	80,000	230	10	2,000	Slack and Darden, 1991
Paleozoic System	2,300	5	12,800	370	5	1,050	Slack and Darden, 1991

content than the rest of the aquifer and produces little water. The remainder of the EMA consists of thin beds of fine to medium glauconitic sand (Boswell, 1963).

The EMA outcrops primarily in the northeastern part of Mississippi and northwestern Alabama. The aquifer dips 35 to 40 ft/mi westward in the northern part of the region (study area), and dips southwestward in the southern part. The thickness of the EMA increases down-dip, ranging from about 1ft in the eastern outcrop area to more than 300 ft in the southwestern part of the region. The EMA receives recharge from precipitation in the outcrop area, and to a lesser extent, from overlying and underlying aquifers (Mallory, 1993; Strom and Mallory, 1995). To the west (locally along the western boundary of Lafayette County), southwest, and south, water becomes increasingly mineralized in the down-dip direction.

The Tuscaloosa Aquifer System (TAS) represents an important regional aquifer system in northern Mississippi. The TAS consists of the Gordo, Coker, and Massive Sand aquifers of the Tuscaloosa Group, along with deeper undifferentiated Lower Cretaceous sediments (Strom and Mallory, 1995). These aquifers are confined by intervening clays and silts, but regionally maintain hydraulic continuity and, therefore, constitute a system (Boswell, 1978). Among the TAS aquifers, only the Gordo aquifer is present in Union County. The TAS outcrops in northeastern Mississippi and western Alabama. The sediments that comprise the TAS dip westward and southwestward toward the axis of the Mississippi embayment at about 35 to 40 ft/mi and generally tend to become thicker in the down-dip direction. Recharge to the Gordo and Coker aquifers occurs in their outcrop areas. These units may also receive recharge by leakage from vertically adjacent aquifers in areas further down-dip. The Massive Sand aquifer is not exposed at land surface and is assumed to receive recharge from the overlying Coker aquifer. Similarly, the Lower Cretaceous aquifer does not outcrop, and recharge is assumed to occur by leakage from the Massive Sand in up-dip areas (Strom and Mallory, 1995). Regionally, the horizontal direction of groundwater movement within the TAS ranges from westerly to southerly away from the outcrop areas.

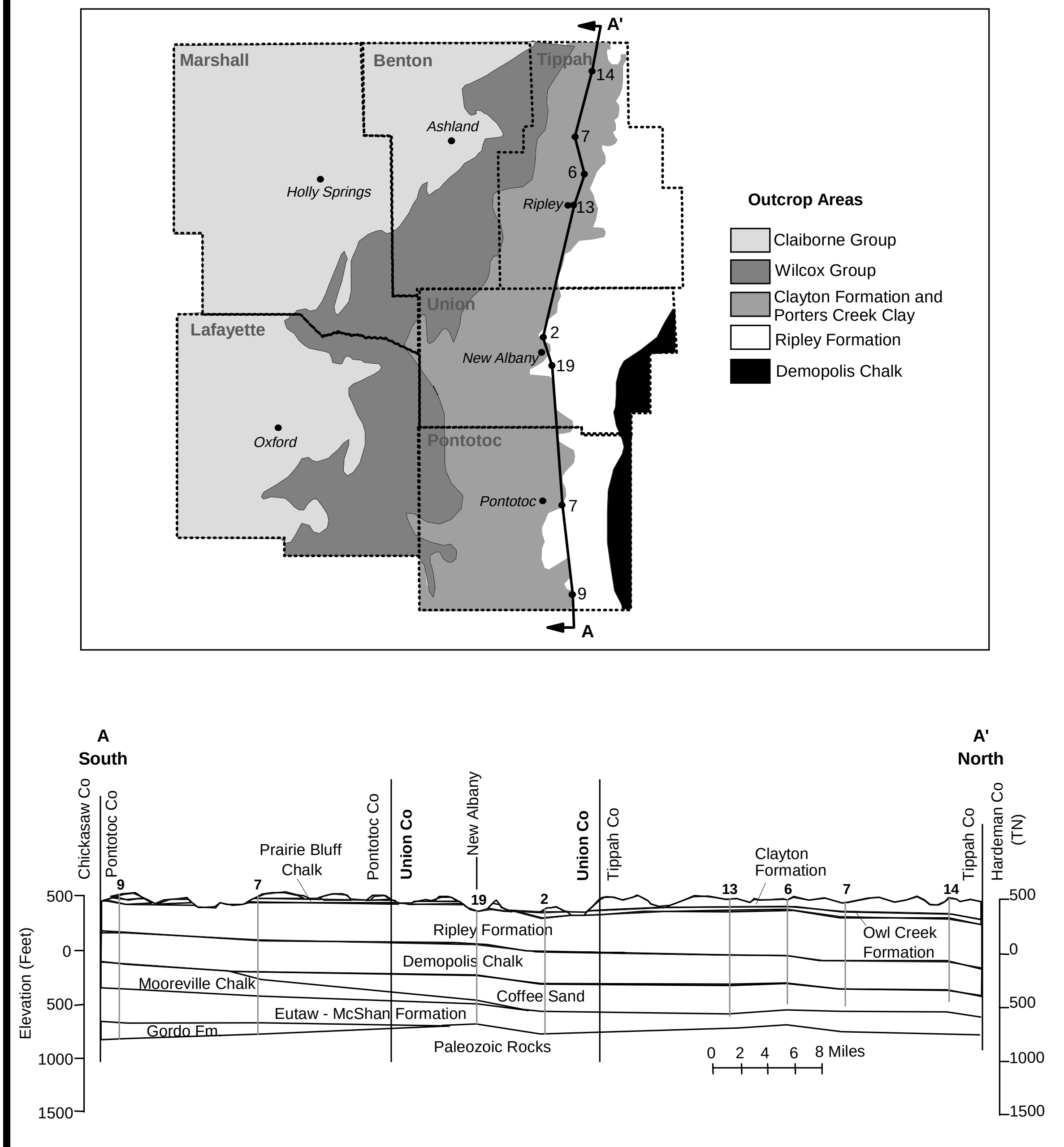
The Paleozoic aquifers (PAS) in Mississippi have generally been treated as undifferentiated in the literature due to lack of data. Recent investigations (Jennings, 1994; Jennings, 1996) have identified two distinct water-bearing units in the Paleozoic Aquifer system (PAS). These lithologic units include the Iowa and Devonian aquifers. The Iowa aquifer comprises a permeable zone in the Fort Payne and Tuscumbia formations that is generally coincident with the upper part of the subcrop of those formations beneath Cretaceous sediments (Jennings, 1994). The Iowa aquifer outcrops in a very small area in northeastern Mississippi. To the northwest, the aquifer is limited by its erosional extent and to the southeast by the extent of its permeable zone. The Iowa aquifer is generally about 100 ft thick, but thins to the northwest until absent at its pre-Cretaceous erosional limit. This boundary occurs just southeast of Union County, such that the Iowa aquifer may not be present in the study area. The Iowa aquifer is expected to receive recharge through a relatively thin interval of unconsolidated Cretaceous sediments in topographically high areas of Tishomingo County (Strom, 1998).

The Devonian aquifer of the PAS comprises a permeable zone in an undifferentiated interval of Devonian age rocks underlying the Chattanooga Shale that is commonly referred to as the “Devonian Chert”. The Devonian aquifer is not considered to crop out in the region (Strom, 1998). To the northeast and east, the aquifer is limited by the pinch-out of permeable rocks. To the southeast and southwest, the aquifer contains water with increasing dissolved-solids concentrations (Jennings, 1994). Because the Devonian aquifer does not outcrop in the region, the only potential for groundwater exchange is with the overlying Cretaceous aquifers or with the Iowa aquifer. The thickness of the Devonian aquifer ranges from 400 ft in Lee County to less than 50 ft in northwestern Union County (Strom, 1998).

3.2.2 Local Hydrogeology

Groundwater is the sole source of supply for residential, commercial, and industrial purposes in Union County (Hutson et al., 2000). Primary aquifers at the site are the EMA and CSA; secondary aquifers in Union County include the Gordo and Ripley aquifers. The outcrops of important aquifers in the study area are shown in Figure 3.2-2. Most of Union County is underlain by the EMA, CSA, and Ripley aquifers. The Gordo aquifer of the TAS is limited to the southern portion of Union County. Since the aquifer is of limited spatial extent and relatively shallow aquifers are available to serve water supply needs, few large groundwater supplies have been developed in the Gordo. Assuming a ground surface elevation of 400 ft-msl, drilling depths necessary for obtaining groundwater from the Gordo are generally greater than 1,000 ft. Known groundwater supplies developed in the Gordo aquifer include those for the Ingomar and Wallerville Water Associations (Cook Coggin Engineers, 1996).

Figure 3.2-2 Outcrop Areas (top) and Stratigraphic Section (bottom) based on Geologic Logs of Enumerated Wells (adapted from Newcome, 1974)



The Eutaw-McShan formations in Union County are considered a single unit (EMA) although most of the larger wells probably obtain water from sands in the McShan formation. According to Cook Coggin Engineers (1996), wells yielding up to 500 gpm have been developed in the eastern and central parts of the county, but because the EMA thins to the west-northwest, the potential of the aquifer in the western portion of the county is limited. Assuming a ground surface elevation of 400 ft-msl, drilling depths to the base of the EMA range from about 800 ft at the Lee County line; 1,150 ft in the New Albany area; and 1,250 ft at Myrtle. The potentiometric surface is estimated to be about 270 ft-msl in the EMA near the central portion of the county (Cook Coggin Engineers, 1996). The majority of existing EMA water supply wells are located near New Albany and pumping over the years has created a depression in the potentiometric surface. A similar situation occurred at Tupelo, however, the potentiometric surface recovered significantly due to substantial reductions in groundwater consumption after that NEMWSD developed a surface water source. A resurgence of groundwater levels would also be expected in the New Albany area of the EMA if the primary water source was replaced by surface water.

The Coffee Sand is a body of irregularly bedded sand, clay, and shale beneath Union County. The proportion of sand to clay and shale decreases in a westward direction. Conditions for developing groundwater supplies in the CSA are best in the eastern and north-central parts of the county (Cook Coggin Engineers, 1996). Assuming a ground surface elevation of 400 ft-msl, drilling depths necessary to penetrate the CSA range from about 500 ft in the extreme eastern part of the county, 900 ft in the New Albany area, and 1,350 ft near the western border of the county. Several industries and rural water associations rely on CSA groundwater supplies in the northeastern part of Union County.

The Ripley formation crops out in the eastern part of Union County and underlies the remainder of the county to the west. The average potentiometric level in the Ripley is near 330 ft-msl but is considerably higher (although variable) in the outcrop area (Pontotoc Ridge) of the county. Most of the artesian wells in the county are in aquifers of the Ripley formation. Wells in the Ripley aquifer range in depth from very shallow in the outcrop area, 200-ft deep near New Albany, and about 600 ft at the western boundary of the county. The Ripley aquifer is the main water supply for the Town of Myrtle and several industries.

3.2.3 Groundwater Quality

Water from shallow wells in the outcrop area of the Ripley aquifer varies considerably in chemical quality. As in other aquifers, groundwater quality becomes more uniform with increasing distance from the outcrop. Normally, water in the Ripley is moderately mineralized and of moderate hardness in Union County (Cook Coggin Engineers, 1996). Newcome (1974) indicates that water in the Ripley is a hard, calcium magnesium bicarbonate type in the eastern half of Union County and a soft, sodium bicarbonate type in the western half of the county. According to Newcome (1974), the Ripley aquifer is expected to exhibit dissolved solids concentrations ranging from about 100 to 300 ppm, iron concentrations of less than 0.3 ppm, silica concentrations of less than 20 ppm, and fluoride concentrations near 1 ppm. The pH is usually near 8.

The CSA yields water with an average dissolved-solids concentration of 250 ppm; most of which is bicarbonate and sodium (Newcome, 1974). Water in the CSA is soft and is used for most purposes without treatment. Newcome (1974) indicates that CSA water hardness is on the order of 30 ppm in Union County. The CSA exhibits a fluoride content (1.6 ppm) in Union County that is relatively high compared to surrounding counties. CSA water is sometimes high in iron content, possibly requiring treatment before consumption. The silica concentration of water in the CSA is less than 15 ppm and pH is about 8.

Based on analyses of water from municipal wells at New Albany, the EMA is considered to be moderately low in dissolved-solids content (approximately 115 ppm). However, the EMA exhibits the highest dissolved-solids content of water relative to other aquifers in Union County and water from the EMA is also the hardest. According to Newcome (1974), in the down-dip areas such as Lafayette County, dissolved-solids concentrations in the EMA probably exceeds 500 ppm. Iron concentrations in the EMA are expected to be low (< 1 ppm) due to near neutral pH values (7 to 8.5) of groundwater. The fluoride concentration in EMA water averages about 0.4 ppm (Cook Coggin Engineers, 1996). Silica concentrations in the EMA are expected to be less than 15 ppm in Union County (Newcome, 1974).

3.2.4 Groundwater Use

The primary aquifers used for large water supplies (i.e., municipal, commercial, and industrial) in Union County are the EMA and CSA. Based on 1998 estimates by Hutson et al. (2000), 80 percent of the water (2.27 mgd) is withdrawn from the EMA; 13 percent (0.37 mgd) from the CSA; 4 percent (0.13 mgd) from the Gordo aquifer; and the remaining 3 percent (0.08 mgd) from the Ripley aquifer. Groundwater supply data obtained from the USGS (Burt, 1999) indicate that the majority of household groundwater supplies in Union County are developed in the Ripley aquifer, although the percentage of total groundwater usage (3 percent) is relatively low. Where the Ripley is absent, the CSA is the primary source of household supplies. Figure 3.2-3 depicts well locations in Union County coded by water use.

Hutson et al. (2000) collected data on municipal (public-supply) and non-municipal (commercial and industrial) water use for 1998 for Union County (Table 3.2-2). In addition to documenting the amount of water use in Union County, the data were used as base-year data to calibrate water demand models. Municipal water withdrawals were either measured by meters at the wells (and the data supplied by the public-supply system); estimated from usage metered at the connection (water sales and unaccounted water); or estimated using an average household rate. Non-municipal rates of withdrawal were provided by individual facilities. Cook Coggin Engineers (1996) list several additional industrial and commercial wells for Union County (Table 3.2-3).

Total groundwater use in Union County increased 27 percent between 1990 and 1998, i.e., from 2.24 mgd to 2.85 mgd (Hutson et al., 2000). Nearly one-half (13 percent) of the increase occurred from 1995 to 1998. Municipal use increased 39 percent from 1990 to 1998 and 19 percent from 1995 to 1998. Self-supplied commercial and industrial use declined 26 percent from 0.40 to 0.29 mgd. Municipal use for 1998 was 2.55 mgd and can be subdivided as follows: 59 percent residential, 18 percent commercial and industrial, and 23 percent public/unaccounted water (Hutson et al., 2000). Non-municipal withdrawals in 1998 were 0.30 mgd.

Figure 3.2-4 shows the locations of wells in the vicinity of the proposed multi-purpose reservoir. In addition to well locations provided by Burt (1999), potential well locations in the immediate vicinity of the proposed lake were provided by the Union County Development Association (Glenn Duckworth, personal communication). Most of the residences in the vicinity of the proposed reservoir are served by the North Haven water distribution system, which basically runs along CR 115 west of Cane Creek, but also runs south and east of the reservoir site on CR 137. According to Duckworth, no more than five residences might be utilizing individual wells where the public distribution system is available. However, it is also possible that some additional wells in this area are used for agricultural or other non-potable purposes. Potential well locations for areas not served by the North Haven water distribution system (Figure 3.1-4) are based on the physical locations of residences. With one possible exception, Burt (1999) indicates that wells serving residences in this area withdraw water from the Ripley aquifer. It is expected that other possible residence well locations identified by Duckworth are also developed in the Ripley aquifer.

In the developed area west of Cane Creek, North Haven possesses one primary and two back-up public supply wells developed in the CSA (C052, C012, and C015). CSA and EMA industrial supply wells located west of Cane Creek (along highway 15) include those for Masterbilt Manufacturing (C011) and Piper Impact, Incorporated (C007, C050, and C054). According to Duckworth (personal communication), Piper Impact relies on North Haven for domestic water but withdraws process water from its wells. Burt (1999) shows the location of a CSA industrial supply well (C009) on the Mississippi Chemical site; however, Duckworth (personal communication) indicates that North Haven supplies this site and this well is no longer used. Ertel Manufacturing owns a CSA industrial supply well (C031) according to Burt (1999).

Figure 3.2-3 Groundwater Supply Wells In Union County (locations from Burt, 1999)

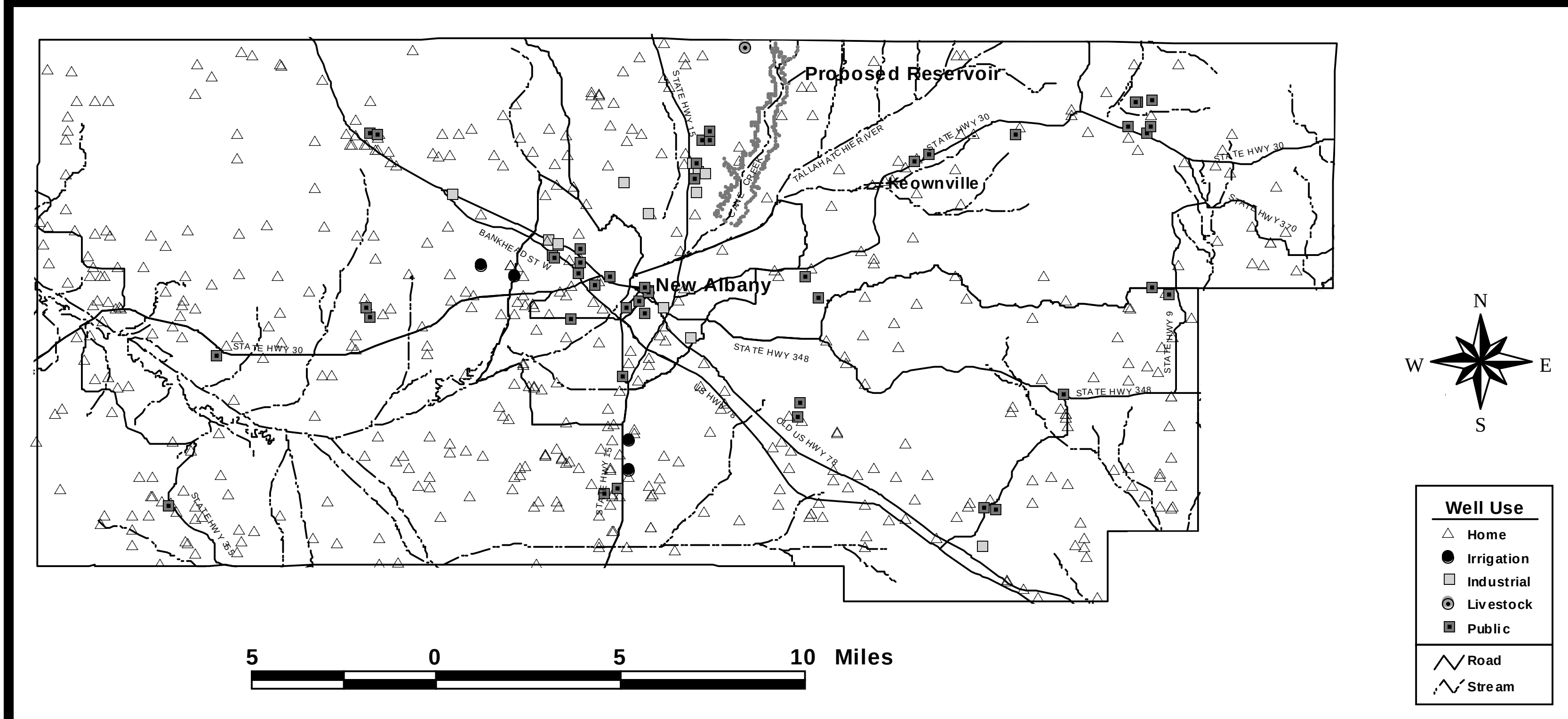


Table 3.2-2 Municipal and Non-Municipal Facilities, Source(s) Of Supply, and Water Use for Union County for 1998 (adapted from Hutson et al., 2000)

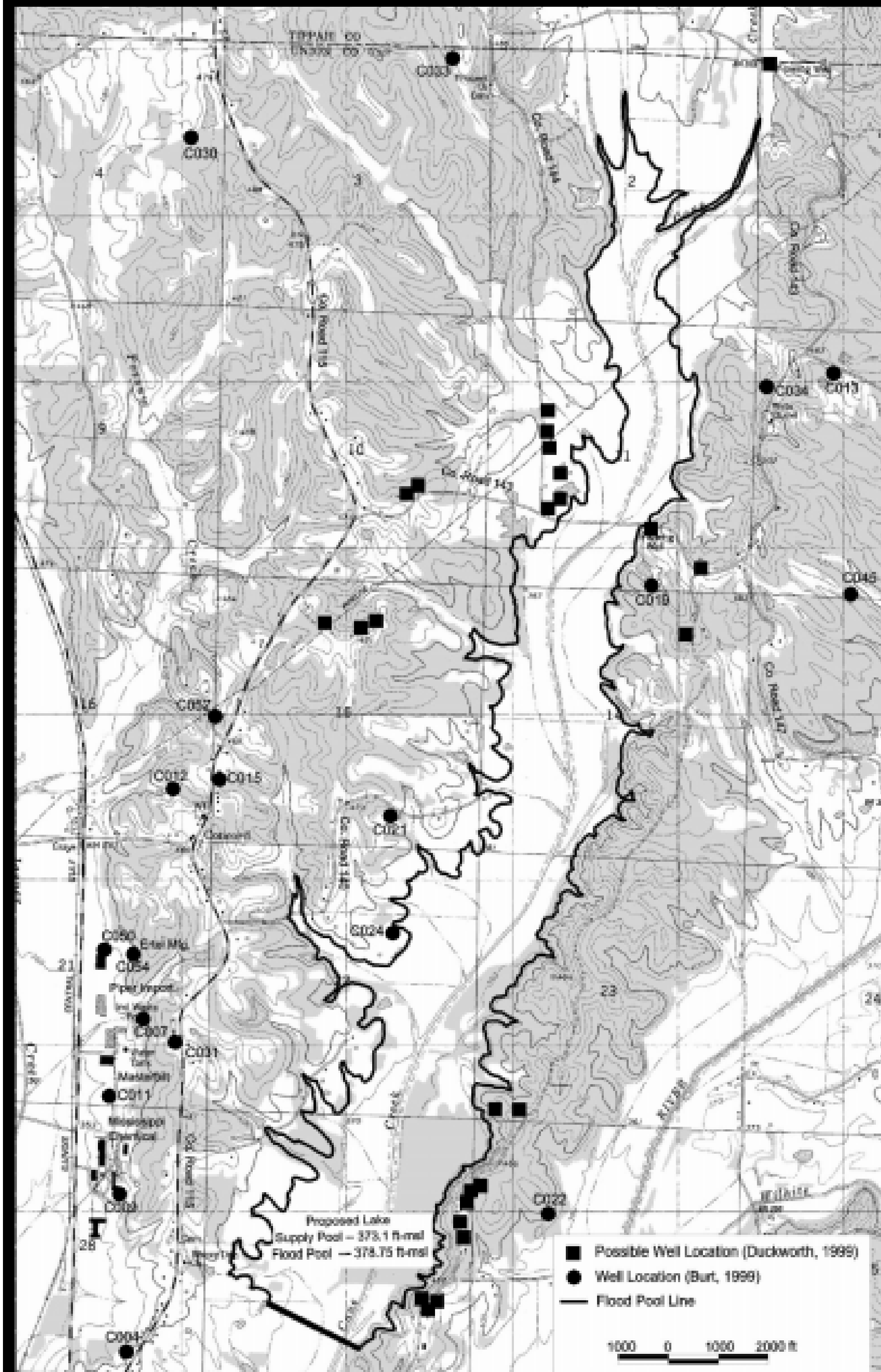
Facility	Source(s) of Supply	Aquifer	Withdrawal (mgd)	Number Residential Connections	Average Household Use (gal/d)
Alpine Water Association	2 wells	EMA	0.073	305	175
Bethlehem Water Association[1]	New Albany Water System			259	211
Blue Springs Water Association	3 wells	EMA CSA	0.145 0.054	497	246
East New Albany Water Association[1]	1 well New Albany Water System	EMA	0.126	434	236
Highway 30 Water Association	2 wells	EMA	0.127	456	180
Igomar Water Association	2 wells	EMA[2]	0.185	587	196
Keownville Water Association	3 wells	CSA[3]	0.192	977	165
Lake Arrowhead	1 well	Ripley	0.007	35	193
Myrtle Water System	2 wells	Ripley	0.065	346	144
New Albany Water System	6 wells[4]	EMA	1.340	2,645	209
North Haven Water Association	1 well	CSA	0.081	332	171
Wallerville Water Association	3 wells	EMA Gordo	0.030 0.129	717	194
Non-municipal Industrial and Commercial Facilities	6 wells[5]	EMA CSA Ripley	0.242 0.044 0.010		
Totals and Averages			**2.85**	**7,590**	**193**

[1] Purchased water = 0.06 mgd
[2] From Gordo aquifer according to Cook Coggin Engineers, 1996
[3] Keownville has two wells in EMA and one in CSA according to Cook Coggin Engineers, 1996
[4] Seven wells in EMA according to Cook Coggin Engineers, 1996
[5] Seventeen industrial and commercial wells according to Cook Coggin Engineers, 1996 (see Table 3.2-3)

Table 3.2-3 Industrial and Commercial Wells in Union County (adapted from Cook-Coggin Engineers, 1996)

Facility	Source(s) of Supply	Aquifer	Rate (gpm)
Hickory Springs Mfg.	1 well	EMA	130
Laher Spring Corp.	2 wells	Ripley	50
Piper Impact, Inc.	2 wells 1 well	CSA EMA	375 300
Standex International Corp.	1 well	EMA	200
Union County School District	1 well 3 wells	EMA Ripley	75 225
New Albany Country Club	2 wells	Ripley	105
Mohasco Upholstered Furniture Corp.	1 well 1 well	Ripley CSA	100 250
Oaks Country Club	1 well	Ripley	60
Mississippi Chemical Company	1 well	CSA	115

Figure 3.2-4 Known Groundwater Supply Wells and Other Possible Well Locations in Vicinity of Proposed Multipurpose Reservoir



3.3 SURFACE WATER

Northeast Mississippi is a highland region with insignificant surface water inflows. Water flows out of the area in all directions. The area is comprised largely of small streams draining to tributaries of the Mississippi River, Tennessee River, and Gulf of Mexico. Most of Tishomingo County and the northeastern portion of Alcorn drain northeast to the Tennessee River. Most of Alcorn, Tippah, and Benton Counties drain northwest to the Mississippi River through the Wolf and Hatchie River Basins. Lee County, Itawamba County, most of Prentiss County, and the eastern portion of Union County drain south to the Gulf of Mexico by way of the Tombigbee River. The Tennessee-Tombigbee Waterway connects the Tennessee River with the Tombigbee River and provides a navigation route to the Gulf of Mexico. The western two-thirds of Union County and portions of Benton and Tippah Counties drain southwest to the Mississippi River through the Yazoo River Basin.

Physiographic districts include the North-Central Hills, Flatwoods, Pontotoc Ridge, Black Prairies, and Fall Line Hills. Altitudes range from 806-ft sea level atop Woodall Mountain in central Tishomingo County (the highest point in Mississippi) to approximately 280 ft in western Union County. Precipitation averages about 58 inches per year. March is typically the wettest month, averaging about 6.5 inches. October is normally the driest month, averaging 3.5 inches. Temperatures range from about zero to 100 ^{o}F (37.8 °C), with an annual average of about 60 ^{o}F (15.6 °C).

The Little Tallahatchie River is the largest stream in Union County. It enters the northern boundary of the County near Molino, travels southeast through New Albany, and leaves the eastern County boundary near Etta. The drainage area of the Little Tallahatchie at Etta is 526 square miles. Cane Creek enters the Little Tallahatchie River near Highway 15, just north of New Albany. The drainage area of Cane Creek upstream of the proposed dam is 28.7 square miles.

Approximately 35 percent of the annual rainfall is carried out of the area by surface streams. Stream flows vary significantly, depending on rainfall, land use, season of the year, geology, and topography. Average annual flows typically range from 1 to 2 cubic ft per second per square mile of drainage area. Table 3.3-1 compares available data for four USGS gauging stations in Union County. Annual runoff from the Little Tallahatchie River at Etta averages 883 cubic ft per second (1.68 cubic ft per second per square mile). Annual runoff at the gauging station on Cane Creek is 40 cubic ft per second (1.80 cubic ft per second per square mile).

Low flows during dry periods are important to aquatic life, water quality, and water supply. Aquatic life is dependent on the availability of water and the wetted perimeter of the stream. Wastewater discharges require sufficient water for assimilating the discharged effluent. Water supplies require sufficient storage to meet demands during low flow periods. Newcome (1974) analyzed stream gage records at 31 sites in the area to determine low-flow frequencies. The resulting dry-season flows differed greatly from location to location, due to a number of factors including size of drainage basin, topography, type of vegetative cover, and in which aquifer outcrop area the basin was situated. The 7Q10 flow varied from less than 0.05 cfs/sq mi to more than 0.5 cfs/sq mi in a few basins. In most cases, the 7Q10 flow serves as the minimum for state water quality criteria and effluent limits.

Drainage basins located on outcrop areas of the Wilcox and Midway Groups had the lowest dry-season flows, whereas streams located in the Meridian Sand had the highest dry-season yields due to the release of water from this sandy aquifer. The majority of Union County lies within the "less than 0.05 cfs/sq mi" category. Only the eastern fourth of the county which overlies the Demopolis Chalk and the Selma group had dry-season flows in the 0.05 to 0.5 cfs/sq mi range. The 7Q10 flow for Cane Creek and the Little Tallahatchie River at Etta are 0.06 and 9.8 cfs, respectively (Table 3.3-1). Using the USGS gauging station record, the projected 7Q10 flow of the proposed Cane Creek dam site is 0.78 cfs.

Table 3.3-1 Stream Flow Stations In Union County

			Average Flow		7Q10 Low Flow[1]	
Name	**Drainage Area (miles^2)**	**Years of Record**	**(ft^3/sec)**	**(ft^3/sec per mile^2)**	**(ft^3/sec)**	**(ft^3/sec per mile^2)**
Little Tallahatchie at Etta	526	60	883	1.68	9.8	0.02
Little Tallahatchie near New Albany[2]	23.9	2.4	43.6	1.83	9.8	0.37
Hell Creek	27.3	1.4	25.6	.94	-	-
Cane Creek	22.2	24.3	40.0	1.80	0.78	0.03

[1] The lowest flow occurring over a seven-day period with a ten-year frequency.
[2] Station located upstream of the Cane Creek confluence with the Little Tallahatchie River.

Water quality in area streams is generally suitable for most uses. The MDEQ (1995) establishes water quality criteria and stream use classifications. Most of the streams in the area (including Cane Creek) are classified for fish and wildlife. Reservoirs are classified for recreation. The Tennessee River and Yellow Creek are classified for public water supply. Several streams are water quality limited (Section 303(d) of the Clean Water Act), including the Little Tallahatchie River, Lockes Creek, and the Tallahatchie River Bottom in Union county.

The Little Tallahatchie River is classified for aquatic life and contact recreation. Secondary contact recreation is impaired. Pathogens, and copper and zinc, are listed by the state as the cause for impairment. Lockes Creek, near Enterprise, MS, is classified for aquatic life. Impairment is due to pesticides, nutrients, siltation, organic enrichment, and low dissolved oxygen. The Tallahatchie River bottom, near Martintown, is classified for aquatic life. Impairment causes are pesticides, nutrients, siltation, organic enrichment, low dissolved oxygen, and suspended solids.

Water quality in Cane Creek was monitored from December 1998 through November 1999 to characterize conditions and provide data for evaluating the proposed reservoir. A continuous monitor was installed just upstream of CR 137. Monthly grab samples were collected at the monitor location and at CR 143. Tables 3.3-2 and 3.3-3 summarize the parameters sampled and the results. Data plots are given in Appendix C-2, Figures C-2.1 and C-2.2.

Water quality in Cane Creek and the streams crossed by the pipeline from Tupelo to New Albany (i.e., Town, King, Sand, and Okannatie Creeks) is typical of small streams in northeast Mississippi. The data collected from Cane Creek showed temperature variations from 33.3 to 91 °F (0.7 to 32.8 °C). The maximum observed temperature was slightly above the state water qulaity criterion of 90 °F (32.2 °C). The dissolved oxygen concentration varied from 4.6 to 15.6 with a mean of 8.4 ppm. The state criterium for dissolved oxygen is a daily average of 5.0 ppm. Turbidity varied from zero to 961 with a mean of 101 NTU. State criteria indicate that turbidity not be increased more than 50 NTU above background levels. The pH varied from 6.3 to 8.2,compared to a state criterion of 6.5 to 9.0. The mean alkalinity, color, and hardness were approximately 82 ppm, 27 PCU, and 86 ppm, respectively. Mean total phosphorus and total nitrogen concentrations showed slight enrichment at 0.09 and 0.39 ppm, respectively. Fecal coliform counts per 100 mL at the C R 137 monitoring station exceeded established limits during the monitoring period, ranging from 91 to 1,600 with a geometric mean of 281.9. Mississippi water quality criteria standards indicate that fecal coliform shall not exceed a geometric mean of 200/100-mL nor shall more than 10 percent of the samples during any one month exceed 400/100-mL in waters classified for raw water supply, recreation, and fish and wildlife (Mississippi Department of Environmental Quality 1995). Metal concentrations were within expected ranges, although high concentrations of iron and aluminum were observed. In general, higher levels of turbidity and other parameters were usually associated with increased stream flow.

Table 3.3-2 Summary Of Water Quality Sampling Of Cane Creek At County Road 137 (December 1998 through November 1999)

Parameter	Units	Number of Observations	Minimum	Mean	Maximum	Standard Deviation
Continuous Monitor						
Streamflow	(cfs)	296	3.3	37.94	1977	131.35
Temperature	(oC)	286	0.7	17.60	32.8	7.26
Dissolved Oxygen	(ppm)	286	4.6	8.40	15.6	2.06
Turbidity	(NTU)	250	0.0	100.9	961	170.7
pH	(su)	286	6.3	7.57	8.2	0.28
Specific Conductivity	(us/cm)	286	30.8	192.6	302	65.1
Oxidation-Red. Potential	(mV)	286	325	525.1	661	68.4
Depth	(ft)	286	0.0	0.38	4.6	0.52
Monthly Samples						
Alkalinity	(ppm CaCo3)	12	32	82.0	138	34.2
Color	(PCU)	12	10	26.7	90	25.5
Apparent Color	(PCU)	12	15	53.3	200	68.8
Ca/Mg Hardness	(ppm)	12	41.5	86.1	141.7	39.9
Total Suspended Solids	(ppm)	12	1	62.9	490	143.5
Volatile Sus. Solids	(ppm)	12	1	7.3	36	12.1
Chem. Oxygen Demand	(ppm)	12	5	12.3	33	10.3
Biochem. Oxy. Demand5	(ppm)	12	2	2.17	4	0.58
Fecal Coliform	(Col./100mL)	12	91	281.9*	1600	532.2
Diss. Ortho Phosphorus	(ppm)	12	0.01	0.023	0.15	0.040
Total Phosphorus	(ppm)	12	0.01	0.094	0.41	0.115
Total Nitrogen	(ppm)	7	0.15	0.457	1.09	0.274
Ammonia Nitrogen	(ppm)	7	0.01	0.030	0.06	0.020
Organic Nitrogen	(ppm)	12	0.02	0.302	0.82	0.210
NOx Nitrogen	(ppm)	12	0.01	0.138	0.32	0.127
Total Organic Carbon	(ppm)	12	1.8	2.98	6.0	1.24
Total Inorganic Carbon	(ppm)	12	7	19.33	33	9.28
Total Carbon	(ppm)	12	11.2	22.32	35.2	8.73
Total Calcium	(ppm)	12	13	29.9	50	14.4
Total Magnesium	(ppm)	12	1.6	2.77	4.4	1.05
Total Chloride	(ppm)	10	3	8.00	29	8.98
Total Iron	(ug/L)	12	410	3798	20000	6704
Total Manganese	(ug/L)	12	27	115.8	540	146.8
Total Sulfate	(ppm)	12	8	14.3	36	7.9
Total Copper	(ug/L)	12	10	10.0	10	0.0
Total Zinc	(ug/L)	12	10	10.8	20	2.9
Total Aluminum	(ug/L)	12	130	2565	14000	4698

*geometric mean

Table 3.3-3 Summary Of Water Quality Sampling Of Cane Creek At County Road 143 (December 1998 through November 1999)

Parameter	Units	Number of Observations	Minimum	Mean	Maximum	Standard Deviation
Monthly Samples						
Alkalinity	(ppm CaCo3)	12	32	85.9	138	37.2
Color	(PCU)	12	10	24.6	70	19.5
Apparent Color	(PCU)	12	15	47.5	175	54.3
Ca/Mg Hardness	(ppm)	12	40.3	88.7	143.4	39.8
Total Suspended Solids	(ppm)	12	1	32.2	230	67.6
Volatile Sus. Solids	(ppm)	12	1	5.5	27	8.1
Chem. Oxygen Demand	(ppm)	12	5	10.8	28	7.6
Biochem. Oxy. $Demand_5$	(ppm)	12	2	1.99	2	0.03
Fecal Coliform	(Col./100mL)	12	5	124.0*	1428	476.4
Diss. Ortho Phosphorus	(ppm)	12	0.00	0.017	0.08	0.021
Total Phosphorus	(ppm)	12	0.01	0.065	0.27	0.071
Total Nitrogen	(ppm)	7	0.15	0.400	0.82	0.179
Ammonia Nitrogen	(ppm)	7	0.01	0.027	0.05	0.015
Organic Nitrogen	(ppm)	12	0.12	0.280	0.63	0.145
NOx Nitrogen	(ppm)	12	0.01	0.104	0.22	0.087
Total Organic Carbon	(ppm)	12	2.1	3.07	5.8	1.22
Total Inorganic Carbon	(ppm)	12	7	20.33	33	9.36
Total Carbon	(ppm)	12	11.0	23.40	35.5	9.11
Total Calcium	(ppm)	12	13	31.2	51	14.4
Total Magnesium	(ppm)	12	1.6	2.65	4.2	1.01
Total Chloride	(ppm)	10	3	3.50	5	0.71
Total Iron	(ug/L)	12	280	2434	13000	4073
Total Manganese	(ug/L)	12	51	106.7	230	63.4
Total Sulfate	(ppm)	12	7	13.7	35	7.7
Total Copper	(ug/L)	12	10	10.0	10	0.0
Total Zinc	(ug/L)	12	10	10.0	10	0.0
Total Aluminum	(ug/L)	12	60	1620	8900	2883

*geometric mean

3.4 AQUATIC ECOLOGY

As described in Section 3.3, the land surrounding the proposed multipurpose reservoir lies within the Cane Creek watershed of the Little Tallahatchie River drainage. Cane Creek flows southward from Tippah County into Union County where it merges into the headwaters of the southwestwardly flowing Little Tallahatchie River, approximately 50 river miles upstream from Sardis Lake. Below Sardis Lake, the Little Tallahatchie and Coldwater Rivers join to form the Tallahatchie River before entering the Yazoo River, which empties into the Mississippi River at Vicksburg.

Under the pipeline alternative, four perennial streams would be affected. The proposed pipeline route runs along the north boundary of U.S. Highway 78 from the southeast portion of New Albany to the north side of Tupelo. The pipeline would cross three streams in the Little Tallahatchie drainage (King Creek, Sand Creek, and Okannatie Creek) and one stream (Town Creek) in the upper

Tombigbee River drainage, which ultimately enters Mobile Bay and the Gulf of Mexico near Mobile, Alabama.

Very little existing information was available to characterize the aquatic ecology of Cane Creek and other streams potentially impacted by the various project alternatives. In order to describe the benthic macroinvertebrate (relatively large, bottom-dwelling invertebrates such as crayfish, mayflies, and mussels) and fish communities in the streams, specific field studies were conducted. Samples were collected at four stations in Cane Creek (Table 3.4-1) ranging from below the proposed dam site to what would be the upper limit of the reservoir, and at one site in the Little Tallahatchie River near the mouth of Cane Creek. King, Sand, Okannatie, and Town Creeks, all of which could be impacted under the pipeline alternative, were also sampled. Pinhook Creek, which drains the watershed immediately east of Cane Creek and could be impacted by Alternative 2 transmission line construction, was not sampled. The aquatic community of Pinhook Creek is assumed to be similar to that of Cane Creek.

Table 3.4-1 Stream Benthic Macroinvertebrate[1] And Fish Sampling Sites And Dates In Areas Potentially Affected By The Proposed Cane Creek Reservoir And Water Supply Pipeline For Union County Water Supply, Winter And Summer 1999

Station Number	Stream	County	Site	Date(s) sampled
Multipurpose Reservoir				
Little Tallahatchie drainage				
1	Cane Creek	Tippah	CR 728	3/1, 6/8
2	Cane Creek	Tippah/Union	CR 143, upstream	3/1, 6/8
3	Cane Creek	Union	CR 143, downstream	3/1, 6/8
4	Cane Creek	Union	CR 137	3/1, 6/8
5	Little Tallahatchie River	Union	U.S. 78	6/9
Water Supply Pipeline				
Little Tallahatchie drainage				
6	King Creek	Union	MS 178	3/2, 6/9
7	Sand Creek	Union	MS 178	3/2, 6/9
8	Okannatie Creek	Union	MS 178	1/11, 6/9
Tombigbee drainage				
9	Town Creek, upstream	Lee	MS 178	1/11, 6/10
10	Town Creek, downstream	Lee	U.S. 45	6/10

[1]Benthic macroinvertebrates were sampled during the summer only

Aquatic habitats in these small streams are similar. Sand and hardened clay are the predominant substrates, although some streams have patches of small gravel. Portions of many streams have been channelized, however most have occasional areas of woody debris (tree roots, brush piles, etc.) and overhanging trees or brush which create cover and habitat diversity for benthic macroinvertebrates and fish. Exposed stretches of ancient, hardened sea floors (with fossilized shells) at station

2 on Cane Creek and station 5 on the Little Tallahatchie provide flat bedrock habitats in some sections that collapse in roughly three-foot waterfalls into clay/sand stretches downstream. King Creek also has large areas of bedrock and rubble, which is unlike substrates in the other streams sampled. Hardened and sculpted into channels by streamflow, with a layer of fossilized shells, the white streambed at the upper Town Creek site (station 9) is vastly different from substrates of other sites. At the time of sampling, water depths varied from a few inches to about 3 ft in most of the streams, except for the lower site on Town Creek (station 10), where depths were estimated to be in excess of 6 ft.

3.4.1 Benthic Communities

Qualitative benthic macroinvertebrate samples were collected at five sites in the Little Tallahatchie drainage potentially impacted by the reservoir alternative and five sites (three in the Little Tallahatchie drainage and two in the Tombigbee drainage) potentially impacted by the pipeline alternative in June, 1999. A D-net was used to collect invertebrates from all discernible habitat types (e.g., leaf packs, root wads, rock/wood, sediment) present at each site. At the time of collection, all recognizable taxa were preserved in formaldehyde for laboratory identification to lowest practicable taxa (by American Aquatics, Inc., Oak Ridge, Tennessee). Stream sampling conditions were near optimal, as the water was low and clear.

Although there were no specific efforts to collect live mussels during benthic macroinvertebrate sampling, any relic mussel shells observed during the course of the site visits were gathered. Identifications were provided by Dr. Paul W. Parmalee, University of Tennessee, Knoxville.

Overall results of benthic macroinvertebrate sampling are summarized in Table 3.4-2. A total of 60 different taxa, including 17 species in the three insect orders used to indicate water quality known as **EPT** [**E**phemeroptera (mayflies), **P**lecoptera (stoneflies), and **T**richoptera (caddisflies)] were found in the Little Tallahatchie drainage that would be potentially impacted under the Multipurpose Reservoir Alternative. The two most diverse insect orders were Coleoptera (beetles) and Diptera (two-winged flies), represented by 12 and 11 taxa, respectively. Odonata (dragonflies and damselflies), Ephemeroptera, and Trichoptera were also fairly diverse orders, as found with 9, 9, and 7 taxa, respectively. (Table C-3.1, Appendix C-3, lists taxa from the sampling sites within the proposed reservoir area).

A total of 44 benthic macroinvertebrate taxa were found in streams within the Alternative 3 project area. These taxa include 36 taxa (14 EPT) from the Little Tallahatchie drainage and 24 (7 EPT) from the Tombigbee drainage. Ephemeroptera was the most diverse order and was represented by 11 taxa. Other relatively diverse orders were Odonata and Trichoptera (6 taxa each), Diptera, and Coleoptera (5 taxa each). (Table C-3.2, Appendix C-3, lists taxa from sampling sites in streams potentially affected by the pipeline alternative).

Table 3.4-2 Summary Of Benthic Macroinvertebrate Orders And Number Of Taxa Found In The Vicinity Of The Proposed Cane Creek Reservoir And Water Supply Pipeline During June 1999

	Proposed Reservoir	Proposed Water Supply Pipeline		
Class Order	Little Tallahatchie	Little Tallahatchie	Tombigbee	Totals
(Number of sites surveyed)	(5)	(3)	(2)	(5)
Oligochaeta	1	-	1	1
Arachnoidae				
Hydracarina	-	1	1	1
Crustacae				
Amphipoda	2	3	1	3
Decopoda	1	1	1	1
Insecta				
Plecoptera	1	1	-	1
Odonata	9	5	3	6
Ephemeroptera	9	8	5	11
Hemiptera	2	1	1	1
Trichoptera	7	5	2	6
Megaloptera	2	-	-	-
Diptera	11	5	4	5
Coleoptera	12	4	3	5
Gastropoda				
Basommatophora	1	1	-	1
Bivalvia				
Veneroida	1	1	1	1
Unionida	1	-	1	1
Total Number of taxa	**60**	**36**	**24**	**44**
Total Number of EPT taxa	**17**	**14**	**7**	**18**

Relic shells of one native mussel species, *Villosa vibex*, were found along Cane Creek at the Tippah-Union county line. Relic shells of another native species, *Lampsilis straminea*, were found at both sites of Town Creek. Judging from the scarcity of relic shells, it is unlikely that mussels are abundant at any of the sites sampled. The non-native Asiatic clam, *Corbicula fluminea*, was found at several locations.

The relative quality of benthic macroinvertebrate communities can be inferred from the diversity of sensitive taxa (i.e., EPT taxa), the abundance of pollution-tolerant taxa (e.g., oligochaetes (segmented worms), chironomids (midges), and simuliids (black flies), and the overall diversity of taxa present. Rapid bioassessment criteria developed by TVA for small streams in the Southeastern Plains and Hills ecoregion (as in western Tennessee) use the number of EPT families collected at a site to indicate its benthic community quality (<5 families = poor, 7-10 = fair, and > 12 = good). Based on these criteria, fair communities occurred at Cane Creek and Little Tallahatchie River sites, with 7-9 families present (Table C-4.1, Appendix C). Communities in Sand Creek (5 EPT families), King Creek (6), and Okannatie Creek (6) are classified as poor to fair, while those of the Town Creek upper site (3) and lower site (6) are poor and poor to fair, respectively (Table C-4.2, Appendix C). Pollution-tolerant taxa were also abundant in the Cane Creek sites, particularly in the middle section, further indication of depressed benthic communities. Similar conditions characterized the streams along the pipeline route. Overall taxa diversity was greatest at the middle Cane Creek (32 and 33 taxa) and Little Tallahatchie River (30 taxa) sites. These sampling results indicate that none of the sites sampled support high quality benthic macroinvertebrate communities.

3.4.2 Fish Communities

Fish communities were sampled concurrently with the benthic macroinvertebrates at the same 10 sites during June, 1999 (Table 3.4-3). Eight sites were also sampled in the winter of 1999, but those samples were somewhat limited by high streamflows. Using a backpack electrofishing (shocker) unit, stunned fish were collected with a seine and/or dip nets, depending on the size of the stream. A 20-ft seine was used at larger stream sites, while a 10 ft seine was used in smaller streams. In the smallest streams, stunned fish were captured using dip nets. All physical habitat types available (such as, pools, riffles, undercut banks, tree roots, brush piles, rock outcroppings, aquatic vegetation) at each stream site were sampled qualitatively to assure all fish species present were collected. Species occurrence and approximate counts of each were noted on field sheets during sampling, and voucher specimens were preserved in formaldehyde solution. Any small and/or questionable specimens were also retained for positive identification at the TVA Aquatic Biology Laboratory in Norris, Tennessee.

Reasonably diverse fish communities were found in project area streams, given the relatively small size of these headwater streams. From the five sites sampled in the reservoir project area, a total of 34 species of 11 families was found in summer samples (Table 3.4-3). The dominant families, Cyprinidae (minnows) and Centrarchidae (sunfishes), were represented by 9 and 6 species, respectively. The three most abundant species were bluntface shiners, emerald shiners, and blacktail shiners. Fifteen species were found in the winter samples, including one species (creek chubsucker) that was not collected during the summer. Seasonal totals of individual fish counted included 2,340 in summer samples and 352 in winter samples. Additional fish were examined, identified, and released during both sampling trips without being counted. None of the species collected at any of the sites are considered endangered or threatened at either the federal or state level.

Similar overall diversity was found at the five sites sampled along the route of the proposed water pipeline from Tupelo (Alternative 3). In the summer samples, 32 total species were found, representing 10 families. Nearly equal diversity was noted in both drainages along the pipeline route, with 19 and 20 species found in the Little Tallahatchie and Tombigbee streams, respectively. As in the reservoir area samples, the dominant families were Cyprinidae (minnows) and Centrarchidae (sunfishes), represented in the pipeline samples by 11 and 7 species, respectively. The three most abundant species were orangefin shiners, longear sunfish, and bluntnose minnows. Seventeen species were collected during winter sampling, including one species (creek chubsucker) absent from summer samples. Seasonal totals counted were 551 and 102 individuals during summer and winter, respectively. Many more fish of the species listed in Table 3.4-3 were examined and released during the course of fieldwork, as the primary effort was to determine species diversity and search for rare species. Once again, no federally or state listed species were collected. The fish species collected at each site are listed in Tables C-3.3 and C-3.4 in Appendix C-3.

The fish diversity at each sample site in Cane Creek ranged from 13 to 21 species, with more species occurring at sites with greater habitat diversity. Twenty-one species were also documented at the Little Tallahatchie River site, although the deepest sections of the river were not sampled due to limitations of the backpack electrofishing gear. It is likely that additional species were present in these sections. All five sites associated with the reservoir alternative were dominated by minnow species; sunfishes were second in abundance.

Generally, fish diversity was lower at sites associated with the pipeline alternative. Only 6 species were collected at the upper Town Creek site and 8 in Sand Creek. Okannatie and King Creeks had 11 and 12 species, respectively, during the summer sample. Eighteen species were found at the lower Town Creek site, with the higher diversity related to stream size and habitat quality.

Table 3.4-3 Summary Of Fish Species, By Family, Found And Approximate Numbers Collected During Summer And Winter (In Parentheses) Qualitative Sampling In Areas Potentially Affected By Proposed Reservoir And Water Supply Pipeline Alternatives, 1999

	Proposed Reservoir	Proposed Water Supply Pipeline		
Species	Little Tallahatchie drainage	Little Tallahatchie drainage	Tombigbee drainage	Total
(Sites surveyed: Summer/winter)	5(4)	3(4)	2(1)	5(5)
Lepisosteidae--gars				
Spotted gar	1			
Longnose gar			1	1
Clupeidae--herrings				
Gizzard shad	4		1	1
Cyprinidae--minnows				
Bluntface shiner	624(80)	53(3)		53(3)
Blacktail shiner	315(35)	17(9)	11	28(9)
Common carp			1	1
Striped shiner		2(2)		2(2)
Pretty shiner			40(5)	40(5)
Redfin shiner	33(5)	4(12)		4(12)
Orangefin shiner	158	77(4)	4	81(4)
Emerald shiner	447		4	4
Mimic shiner	24			
Bluntnose minnow	80(36)	51(31)	24	75(31)
Bullhead minnow	2		17	17
Creek chub	20(4)	25(6)	3	28(6)
Catostomidae--suckers				
River carpsucker			2	2
Creek chubsucker	(1)	(2)	-	0(2)
Northern hog sucker	7(1)	1		1
Blacktail redhorse	14			
Ictaluridae--catfishes				
Black bullhead	19			
Yellow bullhead	3	4(3)		4(3)
Channel catfish	14		1	1
Brown madtom	1			
Fundulidae--topminnows				
Blackspotted topminnow	49(21)	9	-	9
Poeciliidae--livebearers				
Western mosquitofish	22		4	4
Atherinidae--silversides				
Brook silverside	4	1		1
Centrarchidae--sunfishes				
Green sunfish	47(30)	27(7)	1	28(7)
Bluegill	79(65)	62(2)	2	64(2)
Dollar sunfish			1	1
Longear sunfish	207(58)	80(6)	1	81(6)
Redear sunfish	1	1		1
hybrid sunfish	1	1		1
Spotted bass	38(3)	4		4
Largemouth bass	8(1)		3	3
Percidae--perches				
Harlequin darter	1			
Brighteye darter	67(9)	1(5)		1(5)
Goldstripe darter	2	3(1)		3(1)
Redfin darter		2(2)	1	3(2)
Dusky darter	14(3)	(2)	4	4(2)
Sciaenidae--drums				
Freshwater drum	13			
Total collected	**2340(352)**	**425(97)**	**126(5)**	**551(102)**
Total species	**34(16)**	**19(16)**	**20(1)**	**32(17)**

3.5 WETLANDS

Wetland resources in Mississippi have suffered a marked decline as the result of channelization of major streams and the clearing of wetlands for agricultural and other purposes. Past land-use changes and stream channelization have resulted in the reduction of total wetland acreage, changes in wetland types, and diminished ecological integrity of many of the remaining wetlands throughout the region. Channelized streams, often 30-ft deep, result in less frequent flooding and allow rapid runoff and drainage of the floodplain. The extensive areas of bottomland forested wetlands that occurred in the major stream bottoms prior to channelization and land clearing are largely absent from the landscape. Overall, Mississippi sustained a net loss of 209,000 out of 4.4 million wetland acres between 1974-1983, the greatest losses occurring in the conversion of forested wetlands to non-wetland or other wetland types (Heffner et al., 1994).

3.5.1 Wetlands in the Project Area

The project areas of the various alternatives are in the watersheds of the Little Tallahatchie River and Town Creek, a tributary of the Tombigbee River. The only remaining large areas of contiguous, undisturbed wetlands in the Little Tallahatchie River watershed, in which the project site is located, occur on federally-owned lands in the Holly Springs National Forest and the Sardis Reservoir Reservation. Large areas of contiguous, undisturbed wetlands may exist in the lower reaches of Town Creek upstream of its confluence with the Tombigbee River, and in the floodplain of the Tombigbee River. However, the creation of the Tennessee-Tombigbee Waterway, as well as agricultural alterations and development in the area, may have altered or eliminated some of the wetlands in these areas.

Wetlands existing today in the bottomland of Cane Creek and similar agricultural bottomlands of second-order streams in the Little Tallahatchie River and Town Creek watersheds consist of physically fragmented wetlands:

1) at groundwater seeps in forested or cleared areas near the base of slopes and in the narrow bottomlands of first-order streams;
2) in depressional areas in undrained pastures;
3) associated with manmade ponds; and
4) created by beavers.

The majority of the wetlands in these altered bottomlands differ from pre-disturbance wetlands in their hydrologic regimes, vegetation communities, and ecological functions. Historically, wetlands in this region were primarily forested, and their structure and functions were controlled hydrologically by the timing and duration of stream flooding. Current wetland types are primarily herbaceous and sapling/shrub communities. Because of the reduced influence of stream flooding (due to channelization), the hydrologic sources consist primarily of artificially ponded (man-made ponds) or dammed (beaver) storm runoff and groundwater seepage, surface runoff and groundwater seepage detained in floodplain depressions, and groundwater seeps at the base of valley side slopes. The large energy and nutrient fluxes and related functions that are typical of seasonally or episodically flooded, bottomland hardwood forested wetlands (Mitsch and Gosselink, 1993) are less pronounced or absent in the current wetlands.

Potential wetland areas in the project area were identified using U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps, NRCS county soil surveys, and topographic maps. The presence or absence of wetlands subject to jurisdiction by the USCOE under Section 404 of the Clean Water Act in these areas was verified by field surveys. Wetland types were classified using the system developed by Cowardin and others (1979).

Field identification of wetlands used the criteria presented in the USCOE Wetlands Delineation Manual (Environmental Laboratory, 1987) and subsequent guidance documents. According to the USCOE criteria, in order for an area to be identified as a jurisdictional wetland it must have positive indicators for hydric soil and wetland hydrology, and a dominance of hydrophytic vegetation. Under normal circumstances, all three parameters must be present for a positive wetland identification.

The dominance of hydrophytic vegetation was determined during the field survey according to the U.S. Fish and Wildlife Service (USFWS) revised (1996) National List of Plant Species that Occur in Wetlands. During the wetlands survey 54 plant species were identified. A list of plant species identified in the wetlands on the project sites is presented in Appendix C-4. This species list includes 17 species classified as obligate wetland species, 21 species classified as facultative wetland species, 14 species classified as facultative species, and 1 species classified as facultative upland.

Hydric soil indicators included soil matrix color, presence of mottles, concretions, and listing of the soil on the National List of Hydric Soils and the Union County, Mississippi, Hydric Soils list (NRCS, 1996). The hydric soils are listed above in Table 3.1-2. Soil colors were determined in the field using Munsell Soil Color Charts. Hydrologic indicators in wetlands on the project sites included water on the surface, saturated soil within 10 inches of the surface, sediment deposits, drainage patterns, and oxidized rhizospheres. Descriptions of the wetlands identified during the 1999 field surveys are presented in Appendix C-4.

The wetland boundaries were not precisely determined in the field, thus the individual and cumulative wetland acreages presented herein are approximate and will differ from actual wetland acreages that would be determined by an actual boundary delineation. Due to the scale and low resolution of the topographic maps and aerial photographs, the approximate boundaries were estimated conservatively. Thus, the wetland acreages provided herein are likely to be overestimates. While the estimated boundaries and acreages are sufficient for a comparison of impacts between project sites, they cannot be used for obtaining permits or determining mitigation ratios. It will be necessary to precisely determine wetland boundaries using the USCOE Manual (Environmental Laboratory, 1987) and, subsequently, to obtain USCOE approval of the delineated boundaries.

3.5.2 Wetlands in the Multipurpose Reservoir Area

The multipurpose reservoir area includes the reservoir pool area, the area within 500 ft of the flood pool, the dam site, the water treatment plant location, the proposed route of the water pipeline from the water treatment plant to the water tower on Fairground Circle in New Albany, and the proposed alternate 1 and 2 transmission line routes (Figure 2.2-1). Table 3.5-1 lists the wetland types and approximate total acreages in the multipurpose reservoir site and associated areas. The wetland locations are shown on Figure 3.5-1.

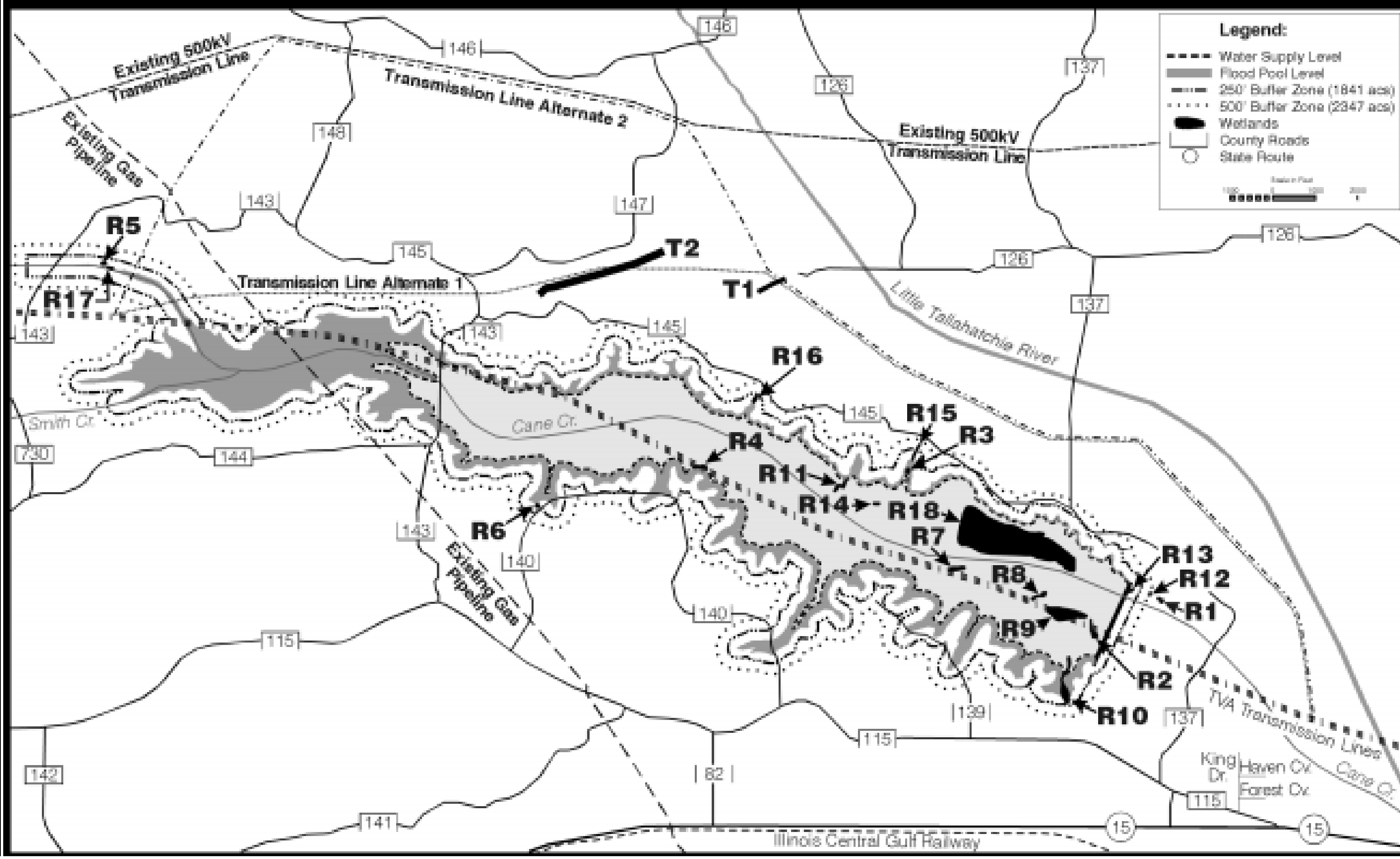
The wetlands in the proposed multipurpose reservoir site include palustrine forested, broad-leaved deciduous wetlands (PFO1) and palustrine persistent emergent (PEM1) wetlands at seeps and springs; palustrine scrub-shrub (PSS1) wetlands created by beavers; PEM1 wetlands associated with farm ponds; and PEM1 wetlands in low areas in pastures. The term "forested, broad-leaved deciduous" refers to a vegetation community dominated by trees that lose their leaves (deciduous) at the end of the growing season. "Scrub-shrub broad-leaved deciduous" refers to a vegetation community dominated by shrubs and saplings of broad-leaved deciduous trees. The term "persistent emergent" refers to a vegetation community dominated by herbaceous vegetation species, the aboveground parts of which persist beyond the end of the growing season.

Table 3.5-1 Wetland Types Associated With The Multipurpose Reservoir Site

Wetland Type	Total Acreage
Palustrine Forested (in reservoir site) (PFO1)	0.9
Palustrine Forested (in transmission line routes) (PFO1)	9.2
Palustrine Scrub-Shrub (PSS1)	39.4
Palustrine Emergent/Scrub-Shrub (PEM1/PSS1)	0.5
Palustrine Emergent (incl. Barkley Rd area) (PEM1)	1.7
Palustrine Emergent (Pond-associated)	1.3
Palustrine Emergent (Farmed Wetland Pasture)	7.8
TOTAL	60.8

The reservoir site is situated on the Jena-Mantachie soil association. These are nearly level (Jena silt loam), and somewhat poorly drained (Mantachie silt loam) soils on floodplains. On areas of Mantachie silt loam, water tends to pond in low areas and runoff is slow. Mantachie silt loam is not listed as a hydric soil series or phase, but is included on the NRCS National List of Hydric Soils and the Union County, Mississippi, Hydric Soil List because of possible inclusions of smaller areas of hydric soil within the soil unit. All of the wetlands identified in the proposed reservoir site appear to be on Mantachie silt loam, with the exception of two small wetlands that appear to be on or near the line delineating Mantachie silt loam and Jena silt loam at the upper end of the proposed reservoir site.

Figure 3.5-1 Location Of Wetlands In The Proposed Multipurpose Reservoir Area



Pond-Associated Palustrine Emergent Wetlands

There are four PEM1 wetlands associated with man-made ponds (wetland R2, R3, and R4), one PEM1 wetland in the area of a drained man-made pond (R5), and one PEM1 wetland (R1) associated with a spring-fed pond at the edge of a small pasture (Figure 3.5-1). Dominant and commonly occurring species in these wetlands include black willow, smooth alder, cattail, soft rush, leathery rush, shallow sedge, Frank's sedge, blunt spikerush, common boneset, dotted smartweed, and pale meadow-beauty. Wetlands R2 and R3 would be within the proposed reservoir summer pool elevation. Wetland R4 appears to be within 250 ft of the flood pool, as is R5. Wetland R1 appears to be in the proposed water treatment plant area.

Palustrine Emergent Wetlands in Pastures

PEM1 wetlands occur in shallow depressions and low areas in pastures in the west floodplain of Cane Creek. These areas typically will have standing water or saturated soil in the winter and through the first half of the growing season, becoming drier as the season progresses. The dominant and commonly occurring species in these emergent wetlands include soft rush, blunt spikerush, lizard's tail, bugleweed, gaping panic grass, beaked panic grass, clustered beakrush, common boneset, leathery rush, dotted smartweed, and pale meadow-beauty.

Although five separate emergent wetlands in pastures are indicated in Figure 3.5-1 (R6, R7, R8, R9, R10), wetland areas R9 and R10 may be connected and form one wetland area. Wetlands R6, R7, R8, and R9 would be within the reservoir summer pool. Wetland R10 would be partially within the summer pool, the flood pool, and the area within 250 ft of the flood pool.

Palustrine Emergent/Scrub-Shrub Wetland in Old Field

A palustrine emergent/scrub-shrub (PEM/SS1) wetland (R11) associated with springs and seeps was identified in an old field and a shrub/sapling thicket on the east side of the Cane Creek bottomland. Species in the wetland include saplings of black willow, green ash, American elm, box elder, and water oak, and shallow sedge, fox sedge, soft rush, leathery rush, woolgrass, cattail, and seedbox. R11 would be within the reservoir summer pool.

Palustrine Scrub-Shrub Wetland

A PSS1 wetland (R18) was identified in the Cane Creek floodplain in the southeast portion of the reservoir basin (Figure 3.5-1). This part of the floodplain is densely vegetated with young saplings, shrubs, and vines in a regenerating clear-cut. A north-to-south channelized stream flows through the area. This channel has been dammed in several locations by beaver, resulting in ponding and some flooding of the area. Species found in the wetland areas include sweetgum, red maple, eastern cottonwood, green ash, sugarberry, ironwood, privet, silky dogwood, buttonbush, soft rush, leathery rush, shallow sedge, bugleweed, aster, giant cane, climbing hempweed, cardinal flower, saltmarsh camphor-weed, spotted touch-me-not, small-spike false-nettle, and swamp rose.

The primary water sources for this wetland are surface runoff, direct precipitation, intermittent tributary streams, and groundwater seeps located near the base of the adjacent slopes. The hydrologic regime provided by the beaver dams appears to have created and maintained the conditions for development of this 39.4-acre wetland. Determination of the wetland boundary was difficult due to vegetation density and presence of standing water during the onsite visit in May. A detailed delineation of the boundary was beyond the scope of the field wetland surveys, but, if completed at a future date, is likely to result in a smaller area of jurisdictional wetland than that indicated in Figure 3.5-1.

Palustrine Forested Wetlands at Seeps

The majority of the area in bottomland forest on the east side of Cane Creek does not meet the USCOE jurisdictional wetland criteria because of the absence of hydric soil. However, jurisdictional forested wetlands (R12, R13, R14, R15, R16, R17) have developed in small seep areas at the base of the adjacent forested slopes and in tributary stream bottoms. The dominant species include American elm, green ash, red maple, sweetgum, lizard’s tail, small-spike false-nettle, spotted touch-me-not, cardinal flower, and sedges.

Wetland R12 appears to be within the 250-ft buffer zone downstream of the proposed dam site and in the proposed water treatment plant site. Wetland R13 is at the proposed dam site. Wetland R14 would be within the reservoir summer pool. Wetlands R15 and R17 would be within and just outside the flood pool area. Wetland R16 would be within 250 ft of the flood pool.

Wetlands in the Proposed Water Line Route Between the Multipurpose Reservoir Site and the Existing Water Tower

The proposed route for the water line from the multipurpose reservoir site to the water tower at Fairground Circle parallels paved county and state roads, including CR 137, State Route 15, the north side of Barkley Road (CR 269), and the west side of Moss Hill Road. Figure 3.5-2 shows the location of wetlands in the water supply pipeline route.

A seasonally saturated, palustrine emergent wetland (R19) occurs in an old field in the floodplain of Lukesasper Canal, on the north side of Barkley Road. Hydrologic sources include direct precipitation, storm runoff, and possibly a seasonally high groundwater table. Species found in this area include saplings of black willow, cottonwood, and green ash, common elderberry, soft rush, woolgrass, *Juncus* sp., Frank’s sedge, and marsh elder.

On the south side of Barkley Road, adjacent to the project area, is a PSS1-PFO1 wetland (R20) in the Lukesasper Canal floodplain. Dominant species include sweetgum, black willow, eastern cottonwood, green ash, common elderberry, gray dogwood, soft rush, and sedges. This wetland is outside of the project area and will not be affected by the installation of the water line.

Wetlands in the Transmission Line Alternate Routes 1 and 2

Two palustrine forested wetlands (T1 and T2) were identified in narrow riparian zones of headwater streams along the two proposed transmission line ROWs. Wetland T1 is located in the proposed ROW before it splits into two separate alternate routes east of the proposed reservoir site. Wetland T2 is located along the proposed alternate 1 route ROW. No wetlands were identified along the proposed alternate 2 route.

The width of these wetlands ranges from approximately 15 to 30 ft in the areas observed during the field survey. The dominant vegetation includes red maple, sweetgum, green ash, tulip poplar, black willow, Nepal grass, small-flowered agrimony, small-spike false-nettle, cardinal flower, bugleweed, Virginia creeper, and sedges. Hydrologic sources are groundwater seepage and streamflow infiltration. Estimated size of wetlands T1 and T2 are 0.95 and 8.3 acres, respectively. These estimates are likely high because of the inherent error in the mapping and measuring technique used. These acreage figures also assume a constant wetland width along the length of the stream bottom, which is unlikely.

Since the proposed transmission line routes were not marked in the field, wetland surveys covered a wide area in the vicinity of the potential ROWs. Determination if either of these wetlands are impacted will be made when a final ROW route is selected.

3.5.3 Wetlands in the Pipeline from Existing Water Supply Site

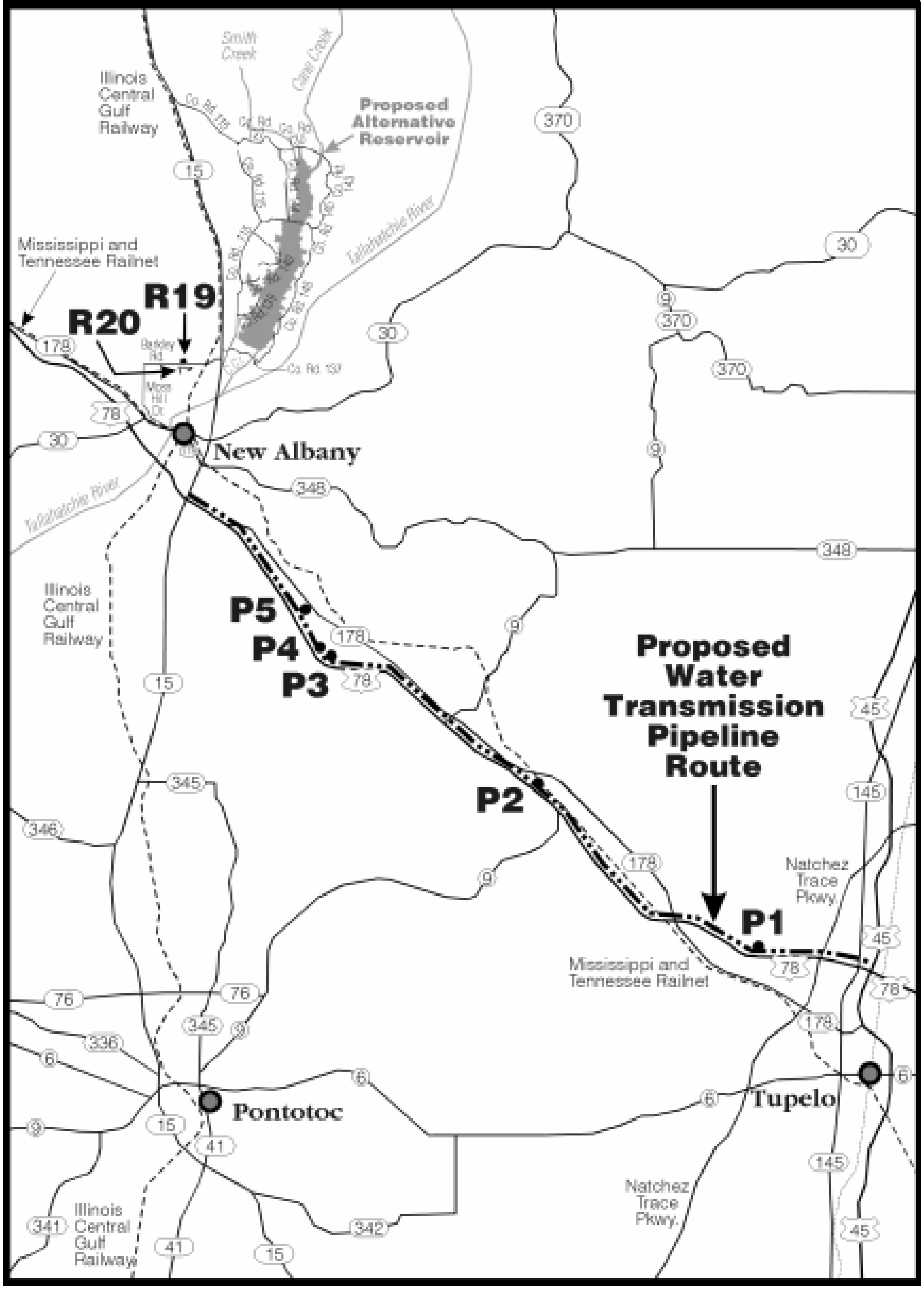
Five wetlands were identified in the proposed route for the water pipeline between Tupelo and New Albany. All five of the wetlands (P1, P2, P3, P4, P5) are palustrine scrub-shrub or palustrine emergent wetlands at the edge of the U.S. Highway 78 ROW (Figure 3.5-2.)

The PSS1 and PEM1 wetlands adjacent to U.S. Highway 78 are associated with small man-made ponds (which are classified as POW) and headwater streams. The dominant species in these wetlands include black willow, sycamore, green ash, silky dogwood, soft rush, and several species of sedges and rushes. Due to the method of mapping and measurement available, and the scale of maps used, no acreage determinations were made for these wetlands. However, all of them are less than one acre.

3.5.4 Wetlands in the Additional Groundwater Sources Sites

Because the locations of additional wells and associated facilities are not known at this time, no information on potentially affected wetlands is available.

Figure 3.5-2 Location Of Wetlands Along The Water Pipeline From The Proposed Multipurpose Reservoir To The Existing Water Tower (Alternative 2) and The Water Pipeline Between Tupelo And New Albany (Alternative 3)



3.6 FLOODPLAINS/FLOOD CONTROL

The multi-purpose reservoir site is located on Cane Creek about two miles upstream of the confluence with the Little Tallahatchie River in Union County, Mississippi. Based on the Union County, Mississippi Flood Hazard Boundary Map page 10, published by the Federal Insurance Administration on April 8, 1977, the dam and reservoir would be located within the identified approximate 100-year floodplain on Cane Creek. Union County currently does not participate in the NFIP. Without participation in this program federal funds can not be used in constructing the dam, pipelines, or relocation of the 161-kV power transmission line. However, Union County is taking steps necessary to join the NFIP.

The 161-kv transmission line that would have to be relocated from the proposed reservoir area, and the pipelines that would be constructed under the various alternatives would cross the floodplains of several streams in Union County, Mississippi. The proposed pipeline from Tupelo would also cross streams in Lee and Pontotoc Counties. Both of these counties participate in the NFIP and have adopted the 100-year flood as the basis for their local floodplain regulations.

3.7 TERRESTRIAL ECOLOGY

3.7.1 Plants

Project-wide Description

The project area occurs in the East Gulf Coastal Plain Section of the Coastal Plain Province as described by Fenneman (1938). Within this Section, most of the project occurs in the area of sandy uplands and associated valleys referred to as the Pontotoc Ridge. A portion of the alternative involving a waterline from Tupelo occurs in the Black Belt, a band of rich lowlands to the east of the Pontotoc Ridge.

The project straddles the junction between the Mississippi Embayment Section of the Western Mesophytic Forest region to the north and the Gulf Slope Section of the Oak-Pine Forest Region to the south as defined by Braun (1950). Original forests of the area were characterized by mixed pine and hardwoods in upland situations, mixed mesophytic forests in ravines and on adjacent slopes, and bottomland forests in swampy valleys.

When Hernando De Soto passed through north Mississippi in 1541, villages, forts, and fields occurred along the Tallahatchie River near the present site of New Albany (Union County Historical Committee, 1990). According to Swanton (1911), by 1800, the Native Americans of the region were raising several kinds of beans, millet, maize (corn), watermelons, peaches, figs, potatoes, tobacco, and two varieties of pumpkin. This suggests an agricultural system dependent on fields. It is reasonable to assume that at least some of the current fields in the project area have their origins in the 16th century or earlier, and that European settlers in the region did not enter a completely forested area.

Forest is a dominant land cover in the project area. In Union County, forest covers slightly over half the land area, and the proportion of forested land increased between 1987 and 1994 from about 45 percent to 53 percent (USDA-NFS 1997). About 50 percent of Pontotoc County and 33 percent of Lee County was forested in 1994. Forest area in both of these counties also increased between 1987 and 1994. Oak-hickory is the most common forest type in Union County, followed by oak-pine and planted pine (Table 3.7-1). The area of planted pine greatly increased between 1987 and 1994, due to conversion of oak-hickory and natural pine forests, as well as the reforestation of former croplands.

Table 3.7-1 Union County, Mississippi Forest Statistics For The Years 1987 And 1994

Forest Type Group*	1987 (acres)	1994 (acres)
Loblolly-Shortleaf Pine		
Planted	0	36,200
Natural	9,300	0
Oak-Pine	27,900	36,200
Oak-Hickory	74,300	60,400
Oak-Gum Cypress	9,300	9,000
Total	**120,700**	**141,800**

*Source of Information: USDA-FS 1995, Forest Statistics for North Mississippi Counties - 1994

Botanical fieldwork supporting this project began in February, 1999 and continued until the end of September, 1999. Four botanists inspected the project areas and noted, in particular, general vegetation patterns, uncommon plant communities, and populations of state- or federal-listed species. Topographic maps and aerial photographs were used to guide fieldwork and to locate potentially important areas. In addition, a local landowner who is a knowledgeable amateur botanist assisted the project botanists in locating uncommon communities and rare plant sites.

Vegetation Types

The present vegetation of the project area can be grouped into eight broad types: grasslands, rowcrop agricultural lands, old field, seedling/sapling, riparian\bottomland forest, hardwood-pine, pine-hardwood, and cedar forests. Kudzu is occasionally a dominant species within the project area and can occur in any of the eight broad vegetation types identified above. Although not distinguished as a separate type, kudzu is the dominant plant species on approximately three percent of the project area. Following are descriptions of the eight vegetation types.

Grasslands are mowed or grazed areas dominated by grasses and herbs. The majority of these areas are hayfields or pasture, although residential lawns are included in this vegetation type. Characteristic species in pasture and hayfields include broad-leaf signal grass, broomsedge, Carolina nightshade, cypress witchgrass, dallisgrass, five-leaf sneezeweed, little bluestem, purple-top tridens, redvine, serrate-leaf blackberry, small dog-fennel thoroughwort, southern carpetgrass, spiny amaranth, tall ironweed, Virginia buttonweed, and woolly croton. A few hayfields are predominantly Bermuda grass or sorghum. Scattered patches of shrubs and trees are typical. These include American sycamore, Chinese privet, eastern red cedar, multiflora rose, and willow oak.

Vegetation is slightly different in wetter pastures where American sweetflag, beaked panic grass, black willow, clustered beakrush, common boneset, common buttonbush, dotted smartweed, gaping panic grass, leathery rush, pale meadow-beauty, and salt-marsh camphor-weed occur. Portions of these wet pastures are classified as palustrine emergent wetlands, described above in Section 3.5.2.

Lawns comprise a very small portion of the grasslands in the project area. Species in lawns include Bermuda grass, dallisgrass, Japanese clover, rough button-weed, and southern crabgrass.

Rowcrop agricultural lands are annually planted in soybean or corn. Various weed species such as common ragweed, giant ragweed, hemp sesbania, ivyleaf morning glory, Johnson grass, pitted morning glory, rough cockle-bur, and southern dewberry are frequently present in addition to the featured crop.

Old field vegetation occurs where hayfields, pastures, or croplands have been left fallow for one or more years. This vegetation type gives way to young forested communities after approximately 10 years, depending on the sites. A key indicator of this vegetation type is that herbaceous species comprise at least 50 percent of the vegetative cover. Characteristic old field species include broom-sedge, common ragweed, giant ragweed, green ash, late-flowering thoroughwort, old-field goldenrod, partridge pea, serrate-leaf blackberry, sugar cane plumegrass, sweetgum, and tall goldenrod.

The **seedling/sapling vegetation** type is representative of forested areas that have been recently harvested. These areas have had 90 to 100 percent of the tree cover removed. The species composition varies from site to site depending on several factors, including the species present prior to harvest, topography, soil type, and the vegetation of surrounding tracts. The most recent clear-cut areas support a number of herbs, shrubs and saplings including Chinese bushclover, common persimmon, common pokeweed, common ragweed, eastern hop-hornbeam, green ash, Hercules club, horseweed, mockernut hickory, late-flowering thoroughwort, partridge pea, small dog-fennel thoroughwort, small-head sunflower, smooth sumac, sweetgum, sweet pignut hickory, winged elm, winged sumac, woolly croton, and yellow sand-aster. The herbs and shrubs tend to be prevalent within the first 10 years after clear cutting and are gradually replaced by woody species of a young forest. Common species in these young forests include Alabama supple-jack, American strawberry-bush, American sycamore, box-elder, crossvine, cupseed, eastern hop-hornbeam, eastern redbud, giant cane, Japanese honeysuckle, muscadine grape, saw greenbrier, summer grape, sweetgum, tulip tree, and winged sumac.

Moist depressions are scattered throughout the seedling/sapling vegetation type. These depressions contain American elder, beaked panic grass, black willow, blunt spikerush, broad-leaf cattail, cardinal flower, climbing hempweed, common boneset, common buttonbush, ditch-stonecrop, Frank's sedge, rice cutgrass, salt marsh camphor-weed, soft rush, and whitegrass. These areas generally occur in stream overflow areas or near springs adjacent to hillsides.

Riparian/bottomland forests occur along streamsides in the project area. Many of the cut over areas have small, scattered riparian stands remaining. These hardwood forests typically have canopies of American beech, black-gum, black walnut, box-elder, cherrybark oak, green ash, red maple, southern shagbark hickory, southern sugar maple, tulip tree, water oak, and white oak. Other characteristic species of these forests include American hornbeam, American beauty-berry, Carolina buckthorn, Christmas fern, common pawpaw, crossvine, cupseed, deciduous holly, eastern hop-hornbeam, eastern redbud, giant cane, Mayapple, muscadine grape, northern spicebush, oakleaf hydrangea, short-styled black-snakeroot, summer grape, Virginia snakeroot, Virginia spider-wort, white baneberry, and wild hydrangea. Bottomland forests have an increased abundance of eastern cottonwood.

The wettest riparian areas, usually adjacent to creeks and springs, have a different group of species in the shrub and herb layer. Plant species in these areas include broad-leaf arrow-head, brook-side alder, cardinal flower, common boneset, lizard's tail, netted chainfern, sensitive fern, sharp-wing monkey-flower, silky dogwood, small-spike false-nettle, southeast decumaria, spotted touch-me-not, trumpet creeper, and whitegrass.

Hardwood-pine forests typically occur in upland areas and contain at least 70 percent hardwoods in the canopy. Trees in this forest type include black locust, black oak, eastern red cedar, loblolly pine, pecan, shortleaf pine, sweet pignut hickory, and white oak. Characteristic understory species include common green-briar, eastern hop-hornbeam, flowering dogwood, Hercules club, and sparkleberry.

Pine-hardwood forests occur where pine makes up least 70 percent of the canopy. Although both loblolly and shortleaf pine were encountered, shortleaf pine dominates in the pine-hardwood forests in the study area. These pine-dominated forests have high proportions of sweetgum as well as black cherry, black-gum, cherrybark oak, common persimmon, eastern red cedar, post oak, southern red oak, and water oak. The understory of pine-hardwood stands is comprised of numerous herbs, vines, and shrubs including bush aster, cat greenbriar, Chinese bushclover, common ragweed, crossvine, flowering dogwood, Japanese honeysuckle, little bluestem, long-leaf spikegrass, muscadine grape, old-field goldenrod, sugar cane plumegrass, and winged sumac. Although technically not pine-hardwood forest, pure pine stands are included in this vegetation type because of their limited extent in the study area. Pine stands include loblolly pine plantations and essentially pure, mature stands of shortleaf pine.

Cedar forests are dominated by eastern red cedar. Associated species include Alabama supple-jack, blackjack oak, Carolina buckthorn, Cherokee sedge, Chinese bushclover, chinkapin oak, common persimmon, eastern redbud, flowering spurge, green ash, Johnson grass, little bluestem, low wild-petunia, nutmeg hickory, poison ivy, rough-leaf dogwood, scaly blazing-star, slippery elm, stiff goldenrod, and sugar-berry. This forest type is found on the basic, marl soils associated with some sections of the pipeline alternative from Tupelo.

Unusual Plant Communities and Managed Areas

Daniels Forest Potential National Natural Landmark is located about 4.5 miles east of the proposed transmission line ROW and 5 miles east of the proposed reservoir site. The National Natural Landmark program was established in the 1970s and is administered by the National Park Service to identify nationally significant examples of ecologically pristine or near pristine landscapes. The program has been mostly inactive for several years, and many potentially qualifying sites have not formally been registered as National Landmarks.

Daniels Forest Potential National Natural Landmark has been described as one of the best forest sites in Mississippi, containing 500 acres of mostly hilly uplands dominated by numerous hardwood species that apparently had not been logged since the period of World War I (Furniss 1980). This site is in private ownership and it is possible that much of it has been recently logged.

Public lands in the Union County area managed for forestry, wildlife and wildlife-oriented recreation include the Hell Creek Wildlife Management Area (WMA), and a portion of Holly Springs National Forest. The 2,344-acre Hell Creek WMA is located about 4 miles northwest of the proposed reservoir site and is managed for hunting by the Mississippi Department of Wildlife, Fisheries, and Parks. Holly Springs National Forest encompasses about 147,000 acres spread over several Mississippi counties. About 6,000 acres of the Forest occur in northwest Union County; the remainder is located to the west, northwest, and southwest of Union County. The Tallahatchie Experimental Forest and the Tallahatchie Experimental Ecological Reserve are located within the Forest. The Upper Sardis WMA is located in the Sardis Reservoir area, roughly 30 miles west of New Albany, and is partially within the Holly Springs National Forest.

Site-Specific Descriptions

Multipurpose Reservoir Alternative

The multipurpose reservoir alternative involves three components. Each of these components are characterized by varying amounts of the locally dominant vegetation types. The three components are:

- Reservoir area, including the reservoir and dam, the area within 500 ft of the reservoir flood pool, and the water treatment plant site. This area is referred to as the reservoir study area.
- Proposed alternative routes 1 and 2 for the required transmission line relocation.
- Water pipeline route from the proposed reservoir to water tower in New Albany.

Reservoir Area—Of the eight broad categories of vegetation occurring in the project area, seven occur in the reservoir area. Based on aerial photographs and field inspections, approximately 70 percent of the reservoir study area is characterized by the agricultural-related vegetation of row crops and grasslands. Early successional habitats (seedling/sapling and old fields) occupy about 17 percent of the study area, and about 12 percent of the area is forested. Table 3.7-2 presents approximate percentages for the various vegetation types

Table 3.7-2 Approximate Percentages Of Vegetation Types Located Within The Reservoir Study Area As Estimated From Aerial Photographs Taken In March 1998 And Field Inspections During 1999

Vegetation Type	% Cover
Row Crops	47
Grassland	21
Seedling/Sapling	19
Hardwood-Pine	6
Riparian/Bottomland	4
Pine-Hardwood	2
Old Field	1

Two **uncommon plant communities** occur in the vicinity of the proposed reservoir. A high quality example of a mature riparian forest community occurs in the area within 500 ft of the proposed flood pool. In addition, a rock outcrop community, uncommon in this portion of the state, occurs near the proposed water treatment plant.

Forested riparian communities *per se* are not uncommon in Mississippi. However, because many of these communities have been destroyed by logging, mature stands are uncommon in northern Mississippi. About 40 acres of mature riparian forests occur in the reservoir study area. These forests are from one to ten acres in size, are scattered in the southern portion of the reservoir site, and contain trees in excess of 100 years old. Most of the state listed plant species (described below in Section 3.8) occurring in the project area are within these communities.

The best tract of mature riparian forests observed on project lands are located on the southwest side of the reservoir area, above the proposed reservoir but within the buffer zone. This single 10-acre site is uncommon in the project area because of its size, age, presence of rare species, and minimal evidence of disturbance. It does not meet United States Forest Service (USFS) old growth criteria.

The single rock community is about 0.25 acres in extent and is located near the extreme southeast corner of the reservoir study area. Geologically, it occurs where the Ripley formation of marl reaches the surface. The rock outcrop community is located downstream of the proposed dam, near the 500-ft buffer line. The small size and the fragile nature of the rock formations makes this community noteworthy for the area. However, similar communities are prevalent in Arkansas, Tennessee, and northward. Specific geologic structure, moisture, and shade provide the rare conditions for the single occurrence of the walking fern spleenwort found during the fieldwork for this project. Cattle grazing in this community is apparently having some negative impact on this species. Adjacent to the rock communities, another state-listed plant, sweet flag, occurs in the moist areas created by springs which surface on the rock.

Proposed Alternative Transmission Line Routes—Route 1 travels along a broad ridge between Cane Creek and Pinhook Creek, crossing various habitats including agricultural lands, recently harvested woodlands, hardwood-pine forests, and riparian/bottomland forests. From the north end of the project area, route 2 crosses both mature and recently harvested forests before intersecting the existing 500-kV transmission line. After sharing the ROW with the existing transmission line for 1.8 miles, route 2 crosses pine-hardwoods, hayfields, and pastures, before re-intersecting the existing 161-kV line.

Vegetation found along alternative route 1 is essentially the same as that found along route 2. More than 50 percent of route 1 would run through seedling/saplings vegetation. Because a portion of route 2 would occur along an existing transmission line right-of-way, seedling/sapling vegetation is even more prominent along this route. Row crop vegetation and grasslands are less frequent along routes 1 and 2 than in the reservoir study area.

No **uncommon vegetation types or plant communities** of state or regional rarity occur along either the alternative 1 or 2 transmission line routes.

Proposed Water Pipeline from Reservoir to Water Tower—Vegetation found along the proposed water pipeline route is similar to that occurring in the reservoir study area. However, because the proposed route is adjacent to existing roads, much of the vegetation occurring along the route is weedy and disturbed. The pipeline route crosses less forested land than either the reservoir area or the transmission line routes. Row crop vegetation and grasslands account for more than 80 percent of the water pipeline route.

No state or regionally **uncommon vegetation types or plant communities** occur along the proposed water pipeline route.

Pipeline from an Existing Water Supply System

The route of the proposed pipeline from Tupelo to New Albany would cross several vegetation types. Approximate percentages of the various vegetation types encountered along the route are provided in Table 3.7-3. Although adjacent to the right-of-way of Highway 78, more than 65 percent of the route is forested. Approximately 33 percent of the route is in hayfields, pasture, or row crops

Table 3.7-3 Approximate Percentages Of Vegetation Types Located Within Pipeline Route From Tupelo As Estimated During Field Inspections In August, 1999

Vegetation Type	% Cover
Row Crops	14
Hayfield or Pasture	21
Hardwood	25
Pine	17
Pine-Hardwood	17
Cedar or Cedar-Hardwoods	6

No state or regionally **uncommon vegetation types or uncommon plant** communities occur along the proposed water pipeline route.

Additional Groundwater Sources

The localities for constructing additional groundwater sources are as yet undetermined. Thus, the vegetation types and plant communities of those locations are unknown. Field surveys would be conducted on the proposed construction sites when future activities are determined.

State or regionally **uncommon vegetation types or plant** communities are unknown at this time. These would be determined through field surveys when localities of future activities are determined.

3.7.2 Animals

A variety of plant communities found on the project area provide important habitat for terrestrial wildlife. These diverse plant communities include habitats such as riparian/bottomland forests, hardwood-pine forests, cedar forests, grassland, and agricultural habitats. In addition to being dominated by distinct vegetated communities, uncommon communities like old growth riparian communities, rock outcrops, seepages, and wetlands provide unique habitats for rare species of wildlife.

Vertebrate wildlife species were surveyed in all major habitat types from August to November, 1999. Surveys identified 119 species of animals within the proposed project area (Table C-5.1, Appendix C-5). Most species and habitats encountered during the field surveys of the project area were locally and regionally abundant.

Vegetation types presented in Section 3.7.1 can be combined to form general wildlife habitat types within the project area. Of all habitats surveyed, **early successional habitats** were the most abundant; comprising about 85 percent of the project area. These habitats include row crop agricultural lands, grasslands, old field vegetation and seedling/sapling vegetation.

Birds that commonly nest or forage in these habitats include:

eastern bluebird	northern bobwhite	dickcissel
yellow-breasted chat	common yellowthroat	eastern meadowark
indigo bunting	white-eyed vireo	wild turkey
blue grosbeak	field sparrow	cattle egret
mourning dove	grasshopper sparrow	

Mammals commonly found in early successional habitats include:

eastern harvest mouse	fulvous harvest mouse
cotton rat	eastern cottontail
least shrew	eastern mole
Virginia opossum	

Reptiles and amphibians commonly found in early successional habitats include:

chorus frog	speckled kingsnake
southern cricket frog	American toad
fence lizard	southern black racer

Woodland habitats make up approximately 12 percent of the project area. These habitats include riparian-bottomland forests, hardwood-pine forests, pine-hardwood forests, and cedar forests. Birds most frequently encountered during point-count surveys in woodland habitats included:

wood thrush	Acadian flycatcher	Carolina chickadee
great-crested flycatcher	red-headed woodpecker	pileated woodpecker
Carolina wren	tufted titmouse	barred owl
red-eyed vireo	pine warbler	red-headed woodpecker
red-bellied woodpecker	summer tanager	

Mammals found in woodland habitats include:

white-tailed deer	fox squirrel
gray squirrel	eastern chipmunk
gray fox	cotton mouse
red bat	short-tailed shrew

Reptiles and amphibians found in woodland habitats include:

slimy salamander	three-lined salamander	American toad
Fowler's toad	northern cricket frog	narrow-mouthed toad
gray treefrog	northern black racer	gray rat snake
speckled kingsnake	eastern worm snake	ringneck snake
three-toed box turtle	six-lined racerunner	ground skink
fence lizard	five-lined skink	

Although **wetland habitats** comprise a small percentage of the project area land cover, they are important to a variety of wildlife species. Wetland habitats on the project area include seepages, springs, temporary pools, small ponds, streams, and a large beaver pond. Birds most often found during wetland surveys included wading birds, such as great blue heron, little blue heron, and green-backed heron; wood ducks, common yellowthroats, red-eyed vireos, and red-winged blackbirds. Mammals that commonly use wetland habitats include beaver, muskrat, raccoon, rice rat, southeastern shrew, mink, and big brown bat. Reptiles and amphibians that were observed in wetlands on the project area include bronze frog, southern leopard frog, bull frogs, cottonmouth, yellowbelly water snake, diamondback watersnake, red-eared pond slider, and spiny soft-shelled turtle.

According to the TVA Regional Natural Heritage Program (TVARNHP) and the Mississippi Natural Heritage Program (MNHP) databases seven caves occur within the four county vicinity (Tippah, Pontotoc, Union, and Lee Counties in Mississippi) of the project area. However, no caves were discovered on the project area during 1999 field surveys.

Transmission Line Routes

Route 1 travels along a ridgeline between Cane Creek and Pinhook Creek and is comprised of a mixture of habitats including agricultural lands, areas of timber harvest, hardwood-pine forests, and riparian/bottomland forests. This route provides wildlife habitats that are regionally common, with the exception of riparian/bottomland forests.

Route 2 travels up a forested hardwood slope, that contains sandy seepages, before intersecting the existing 500-kV transmission line. On this route, Jones (1999) identified bottomland forests along Cane Creek and upland hardwoods on the slope adjacent to road 143 as important habitats. These areas supported the highest numbers of neotropical songbirds on the project area. Many species in this group of songbirds have undergone significant population declines in recent years (including wood thrush, Acadian flycatcher, yellow-billed cuckoo, and great-crested flycatcher). Additionally, Jones suggested that these areas provide suitable habitat for several species of amphibians.

Pipeline from Existing Water Supply

As stated in Section 3.7.1, much of the proposed pipeline route passes along an existing highway corridor, crossing various habitats that are common in the region. There is little residential development along the lower portion of the proposed route, however small stretches of homes are located along the route's upper end. Wildlife observed along the route are considered common. No rare or uncommon wildlife or their habitat were observed along the proposed pipeline route.

<u>Additional Groundwater Sources</u>

The localities for constructing additional groundwater sources are undetermined. Thus, the terrestrial animal communities in those locations are unknown.

3.8 ENDANGERED AND THREATENED SPECIES

The various alternative actions would take place in Union, Lee, and Pontotoc Counties, as well as a very small portion of Tippah County. Prior to the initiation of field studies for this project, available information sources, including those maintained by the MNHP and the TVA RNHP, were reviewed to determine whether federally or state-listed endangered and threatened species had been previously reported from the project area. The U.S. Fish and Wildlife Service (USFWS) was consulted for information on the potential presence of federally listed species.

3.8.1 Plants

One plant species listed by USFWS as threatened, Price's potato-bean (*Apios priceana*), is known from Lee county, Mississippi, one of the four counties in the project area. Fifty-five plant species of conservation concern in Mississippi have been reported from the four county project area. Botanical field investigations were carried out from February through September, 1999, to determine the presence or absence of these species on or adjacent to project lands.

No federally listed plant species or suitable habitats for such species are known from or have been observed on the areas anticipated to be impacted by any of the alternatives. No state-listed plants or suitable habitats for such species occur along either of the proposed transmission line routes or the water pipeline route associated with the reservoir alternative. In addition, no state-listed plants occur along the proposed route of the waterline from New Albany to Tupelo. Because specific sites for wells and routes for the waterlines associated with the Additional Groundwater Sources Alternative have not been selected, information is not available on the presence of rare plant species at these sites.

Ten Mississippi state-listed plant species were located during field investigation of the proposed multipurpose reservoir. An additional species, Harbinger-of-spring (*Erigenia bulbosa*), was encountered and may be added to the state list in the near future. These eleven species are listed in Table 3.8-1 and are described in more detail below.

Table 3.8-1 State-Listed Plant Species Occurring Within The Reservoir Project Area			
Common Name	**Scientific Name**	**State Rank**	**Global Rank**
American ginseng –	*Panax quinquefolius* L.	S3	G4
Butternut	*Juglans cinerea* L.	S2	G4
Canada wild-ginger	*Asarum canadense* L.	S2S3	G5
Green violet	*Hybanthus concolor* (T.F. Forst.) Spreng	S2	G5
Harbinger-of-spring	*Erigenia bulbosa* (Michx.) Nutt.	S1	G4
Lovage	*Ligusticum canadense* (L.) Britt.	S1S2	G4
Narrow-leaf fever root	*Triosteum angustifolium* L.	S3	G5
Smoother sweet cicely	*Osmorhiza longistylis* (Torr.) DC.	S3	G5
Sweet flag	*Acorus americanus* (Raf.) Raf.	S1S2	G5
Turk's-cap lily	*Lilium superbum* L.	S3S4	G5
Walking fern spleenwort	*Asplenium rhizophyllum* L.	S1S2	G5

S1—Critically imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation.
S2—Imperiled in Mississippi because of rarity (6 or 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation.
S3—Rare and uncommon in Mississippi (on the order of 21 or 100 occurrences).
S4—Apparently secure in Mississippi (more than 101 occurrences).
G4—Apparently secure globally (more than 101 occurrences).
G5—Demonstrably secure globally.

American ginseng - *Panax quinquefolius* - This species occupies shady, moist sites, especially under beech and sugar maple and is known from more than 70 localities in Mississippi. American ginseng occurs in the area within 500 ft of the proposed flood pool.

Butternut - *Juglans cinerea* - Butternut favors moist, rich soils but will also grow on drier, rocky limestone soils. Forest stands rarely contain more than an occasional tree. This species occurs in a clear-cut area within the proposed reservoir pool area. This is currently known from 18 additional localities in the state.

Canada wild-ginger - *Asarum canadense* - This species favors rich woods and is often found in colonies. Canada wild-ginger is reported from 24 other localities in Mississippi. This species is within the proposed reservoir pool area.

Green violet - *Hybanthus concolor* - The green violet prefers rich woods and ravines. At least 25 populations of green violet are known in the state. Green violet occurs in the area within 500 ft of the proposed flood pool.

Harbinger-of spring - *Erigenia bulbosa* - This species is an early spring bloomer that favors rich woods. Due to a debilitating illness suffered by the botanist who discovered this population, its exact location is not currently known. However, because habitat for this species (and one additional species found by this botanist) occurs in the area within 500 ft of the proposed flood pool, it is assumed that this species occurs in this zone. Three populations of harbinger-of-spring are known from Mississippi.

Lovage - *Ligusticum canadense* - Lovage is found in moist to dry sites primarily in the mountains. It is known from four localities in Mississippi and is much more common in Tennessee, Georgia, and South Carolina and northward. Lovage occurs in the area within 500 ft of the proposed flood pool.

Narrowleaf fever root - *Triosteum angustifolium* - This species favors moist woods and low ground. It is known to occur at 28 other sites in Mississippi. Narrowleaf fever root is found in the area within 500 ft of the proposed flood pool.

Smoother sweet cicely - *Osmorhiza longistylis*- Smoother sweet cicely is typically found in moist woods or along edges of moist woods. This species is reported from more than 40 other sites in the state. Smoother sweet cicely was found in the area within 500 ft of the proposed flood pool.

Sweet-flag - *Acorus americanus* - Sweet flag is chiefly found on the coastal plain in swamps and shallow waters. It is known from three sites in Mississippi. This species occurs in moist areas adjacent to the rock outcrop community near the proposed dam site.

Turk's-cap lily - *Lilium superbum* - This member of the lily family favors wet meadows and low ground. Due to a debilitating illness suffered by the botanist who discovered this population its exact location is not currently known. However, because habitat for this species (and one additional species found by this botanist) occurs in the area within 500 ft of the proposed flood pool, it is assumed that this species occurs in this zone. Approximately 100 additional populations of this species are known from the state.

Walking fern spleenwort - *Asplenium rhizophyllum* - Walking fern spleenwort is typically found on rock, often limestone, or rarely in humus on tree trunks. Eight populations of this fern are known from Mississippi. This species occurs in the rock outcrop community near the proposed dam site.

All state-listed plant species found in the project area appear to exist as single, small populations. The walking fern spleenwort population, for example, is restricted to the rock outcrop community which occupies a small area. Because some of these species were dormant or near dormant when discovered, more extensive populations may exist within the study area. Additional populations would most likely exist within similar plant communities.

The discussion above and in Section 4.8 deals with those rare plant species observed during the field surveys. During the growing season in which this field investigation was performed, the area experienced a drought lasting approximately 100 days and accompanied by record high temperatures. The impact of this drought on the vegetation was significant. It is possible that some rare plant populations failed to appear above ground or that some populations flowered briefly and were therefore not encountered. Speculation on the presence of such populations is based upon known populations adjacent to the project areas and similar habitats existing within the project areas.

3.8.2 Terrestrial Animals

Jones (1999) conducted field surveys placing special emphasis on locating and identifying populations of federally and state-listed terrestrial animals and rare habitats. Terrestrial animal surveys were restricted to the proposed reservoir project area, the two alternative transmission line routes and the pipeline route between Tupelo and New Albany. No federally-listed or state-listed species were identified on the project area during field surveys. However one state-ranked species, the Cooper's Hawk (Accipiter cooperii), was observed in the project area. In addition to the one species identified in the project area, Jones (1999) and other available information indicated that 15 species of rare terrestrial animals potentially occur in the project area (Table 3.8-2). These species are described below in more detail. The project area is within the range of a few other listed or state-ranked species, including the alligator snapping turtle (*Macroclemys temminckii*), the bald eagle (*Haliaeetus leucocephalus*), and the osprey (*Pandion haliaetus*). These species require large water bodies, which are not found in the project area.

Crawfish Frog - The crawfish frog can be found in a variety of habitats including sandy pine flatwoods and bottomland forests in association with ponds or pools for breeding. This species remains underground during much of the year and was not encountered during field surveys. This species could potentially occur in the Cane Creek floodplain where ponds occur.

Red Salamander - The red salamander is widely distributed in the southeastern United States. It is usually found in mature deciduous forests that contain small creeks, springs or seepages and moist leaf litter. Although no red salamanders were located during field surveys, habitat for this species is present on the project area. Sites on upper forested slopes adjacent to county road 143 could support this salamander.

Mole and Prairie Kingsnakes - These secretive, mostly subterranean snakes are typically found in upland pine habitats having loose, sandy, highly acidic soils. These snakes have also been found in upland hardwood forest and open field habitats. During surveys for reptiles during 1999, no kingsnakes were observed. Jones (1999) suggested that habitat for these species exists on the project area.

Queen Snake - The queen snake is an aquatic reptile that is primarily found in or near streams. Habitat for this species is available on the project area in the unchannelized portions of Cane Creek where riparian vegetation provides basking cover. No queen snakes were observed during 1999 field surveys.

Table 3.8-2 Federal And State-Listed Terrestrial Animals Potentially Occurring Within the Reservoir Project Area (Jones 1999).

Common Name	Scientific Name	Protective Status*	Availability of Habitat
Amphibians			
Crawfish Frog	*Rana areolata*	S3	Yes
Red Salamander	*Pseudotriton ruber*	S3	Yes
Reptiles			
Mole Kingsnake	*Lampropeltis calligaster rhombomaculata*	S3?	Yes
Prairie Kingsnake	*Lampropeltis calligaster calligaster*	S3, S4	Yes
Queen Snake	*Regina septemvittata*	S3	Yes
Birds			
Bachman's Sparrow	*Aimophila aestivalis*	S3?B, SZN	Limited
Bewick's Wren	*Thyromanes bewickii*	S2, S3B, SZN	Yes
Black-crowned Night Heron	*Nyticorax nyticorax*	S3?B, SZN	Limited
Cooper's Hawk	*Accipiter cooperii*	S3?B, SZN	Yes
Red-cockaded Woodpecker	*Picoides borealis*	S1, E	None
Sharp-shinned Hawk	*Accipiter striatus*	S1?B, SZN	Yes
Mammals			
Hoary Bat	*Lasiurus cinereus*	S3?	Yes
Little Brown Myotis	*Myotis lucifugus*	S3?B, S3?N	Limited
Oldfield mouse	*Peromyscus polionotus*	S2, S3	Yes
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	S3?B, S3?N	Limited
Southeastern Myotis	*Myotis austroriparius*	S1?B, S1?N	Limited

*Rather than identifying categories or rarity, such as threatened or endangered, the State of Mississippi categorizes listed rare animals according to a nationally-used status system. The status codes are described in the footnotes to Table 3.8-1. Additional modifiers are: ? - status inexact or uncertain; Z - potentially occurring but no known occurrences; N - status during the non-breeding season; B - status during the breeding season.

Bachman's Sparrow - The Bachman's sparrow inhabits open pine forests with dominant grass communities and is most common in lower Coastal Plain habitats. This sparrow probably once occurred in the project area, however, habitat within the project area is now lacking. Bachman's sparrows were not observed during field surveys.

Bewick's Wren - The Bewick's wren nests in the upper one-third of Mississippi and winters throughout the state. Adequate habitat for this species, including open, brushy fields and riparian woodlands, exists on the area. This species was not detected during field surveys.

Black-crowned Night Heron - The black-crowned night heron is a colonial nesting bird that is generally found on larger rivers and reservoirs. Nesting habitat for this species is very limited on the project area, however, this bird may occasionally forage in Cane Creek and one large wetland area on the site. No black-crowned night herons were observed during 1999 field surveys.

Cooper's Hawk - The Cooper's hawk nests in deciduous forests and forages in open habitats. This species was observed primarily in hardwood-pine forests and bottomland hardwood forests in the project area.

Red-cockaded Woodpecker - The red-cockaded woodpecker is found in mature to old growth pine forests with an open midstory. The project area is north of the current documented range of this species in Mississippi, most records are from the southern portions of the state. Pine and pine-hardwood forests on the project area were evaluated for potential red-cockaded woodpecker habitat. Due to the midstory structure, forest stand age and composition, and lack of prescribed fire, no forest stands suitable for this species occur on the project area. This species was not observed during 1999 field surveys.

Sharp-shinned Hawk - The sharp-shinned hawk prefers pine forests for nesting and may be found in mixed or deciduous forests. This hawk is likely present on the project area even though it was not observed during field surveys. Mixed pine-hardwood forests, interspersed with old fields and grasslands, on the project area provide suitable nesting and foraging habitat for this species.

Hoary Bat - The hoary bat's range covers most of the United States, however it is more common north of the project area. This bat is found roosting in the foliage of trees near open areas, and suitable habitat for this species does exist on the project area. This species was not observed during 1999 field surveys.

Little Brown Myotis - The little brown bat usually hibernates in caves and mines and may inhabit buildings during summer months. This bat forages over water, among trees, and in open areas. This mammal was not observed during field surveys. Limited habitat for this species is found on the project area.

Old field mouse - The old field mouse is found primarily in sandy fields, agricultural fields, and open areas of forests. This species was not observed during 1999 field surveys, however Jones (1999) suggests that this species could inhabit the project area.

Rafinesque's Big-eared Bat - The Rafinesque's big-eared bat is found throughout the southeastern United States in or near areas of mature forests, usually near water. This bat forages in forested areas and forms colonies in caves, hollow trees, sandstone bluffs, and abandoned buildings. This bat was not observed during field surveys. Due to the lack of caves, sandstone bluffs and abandoned buildings on the project area, habitat for this species is limited.

Southeastern Myotis - The southeastern myotis is found in caves, buildings, and hollow trees and usually forages over water. This species has been recently tracked by the MNHP and occurrence records for this species in Mississippi are rare. The southeastern myotis was not detected during 1999 field surveys. This bat may utilize the project area for foraging, however the site provides limited habitat for this species.

3.8.3 Aquatic Animals

Based on reviews of the Mississippi Heritage Program and the TVA Regional Heritage Project data bases, no federally listed aquatic species are known from or likely to occur in streams potentially affected by the various alternatives. Five aquatic species of conservation concern are known from Lee, Pontotoc, Tippah, and Union Counties (Table 3.8-3). However, thorough site surveys did not detect the presence of these or other listed species in affected streams within the project area (see Section 3.4.2).

Table 3.8-3 State-Listed Aquatic Species Known From Lee, Pontotoc, Tippah, And Union Counties, Mississippi

Common Name	Scientific Name	Protective Status*	Likely in Project Area?
Crayfish			
Tombigbee rivulet crayfish	*Hobbseus petilus*	S2	No?
a crayfish (no common name)	*Procambarus ablusus*	S3	No
Fish			
Spotfin shiner	*Cyprinella spiloptera*	S2	No
Steelcolor shiner	*C. whipplei*	S3	No
Northern madtom	*Noturus stigmosus*	S1	No

*See footnotes to Table 3.8-1 for definitions of status codes.

<u>Tombigbee rivulet crayfish (*Hobbseus petilus*)</u>: Known from unnamed tributaries of Patch and Euclautubba creeks (Tombigbee River drainage) northwest of Tupelo, Mississippi. As the common name implies, habitat is small, sluggish streams (<30 cm deep) in the Tombigbee River drainage. Individuals are commonly associated with sedges (Fitzpatrick, 1977). No specimens of this crayfish were found during 1999 sampling, however, it could potentially occur within the pipeline alternative project area.

<u>A crayfish - no common name (*Procambarus ablusus*)</u>: All known Mississippi records are from streams in the Hatchie River drainage in Tippah County (outside the project area). No specimens of this crayfish were found during 1999 sampling. It is unlikely to occur in the project area.

<u>Spotfin shiner (*Cyprinella spiloptera*)</u>: All valid Mississippi records are from streams in the Tennessee River drainage in extreme northeastern Mississippi (outside the project area). A dubious record from Little Tallahatchie River (Yazoo River drainage), Union County, exists in the MNHP data base (Gibbs, 1963; Ross, 1985). No specimens of this fish were found during 1999 sampling. If populations of spotfin shiners occur within the project area, they are outside the known historic range of the species and are probably the result of human introduction. This species is widespread and common throughout its native range.

<u>Steelcolor shiner (*Cyprinella whipplei*)</u>: All valid Mississippi records are from streams in the Tennessee River drainage in extreme northeastern Mississippi, and the Hatchie River drainage in Tippah County (outside the project area). Dubious

records from Little Tallahatchie River system (Yazoo River drainage), Union County, exist in the MNHP data base (Gibbs, 1963; Etnier and Starnes, 1993). No specimens of this fish were found during 1999 sampling. If populations of steelcolor shiners occur within the project area, they are outside the known historic range of the species and are likely the result of human introduction. This species is widespread and common throughout its native range.

Northern madtom (*Noturus stigmosus*): Nearest known records are from streams in the Hatchie River drainage in Tippah County, Mississippi (outside the project area). No specimens of this fish were found during 1999 sampling. It is unlikely to occur in the project area.

3.9 CULTURAL RESOURCES

Cultural resources include, but are not limited to: prehistoric and historic archaeological sites, historic structures, and historic sites that were the location of important events where no material remains of the event are present. There is a long record of human use and occupation throughout north-central Mississippi.

Archaeological Resources

North central Mississippi has been the location of human occupation for over 12,000 years. The prehistory and history of the area is generally divided into six - broad periods: Paleoindian (10,000-8,000 BC); Archaic (8,000-1000 BC); Gulf Formational Period (1100-300 BC); Woodland (300 BC-AD 900); Mississippian (AD 1000-1700); and Historic (AD 1700-present) (Bense, 1982, 1994; Walthall, 1980). Each of these broad periods is generally broken into sub-periods (generally Early, Middle, and Late), which are also based on artifact styles and settlement patterns. Smaller time periods, known as "Phases" are representative of distinctive sets of artifacts.

The Paleoindian period (10,000-8,000 BC) represents the first human occupation of the area. The settlement and land use pattern of this period was dominated by highly mobile bands of hunters and gatherers. The subsequent Archaic period (8,000-1,000 BC) represents a continuation of the hunter-gatherer lifestyle. Through time there is increasing social complexity and the appearance of horticulture late in the period. The settlement pattern during this period is characterized by spring and summer campsites situated along river ways that exploit riverine resources and dispersed fall and winter campsites in the adjacent uplands. It is during the Gulf Formational Period (1100-300 BC) when pottery first appears in north-central Mississippi. The Early Gulf Formational Period is a transitional period from the Late Archaic during which there is a continuance of Archaic Period settlement patterns but there are also influences from the Gulf Coastal area to the south. The Early and Middle Gulf Formational periods are associated with Wheeler series, fiber-tempered pottery. The Late Gulf Formational Phase is associated with Alexander series, fiber- and sand-tempered pottery, and correlates with Early Woodland Period cultures elsewhere. Increased social complexity, reliance on horticulture and agriculture, and a continuation and enhancement of ceramic technology characterize the Woodland Period (300 BC-AD 900). The increased importance of horticulture is associated with a less mobile lifestyle as suggested by semi-permanent structures. Residential base camps were located on flood plains and alluvial terraces with specialized procurement sites in the adjoining uplands. The Middle and Late Woodland Periods are classified by various Miller Phase components. The Mississippian Period (AD 900-1700), the last prehistoric period in north-central Mississippi, is associated with the pinnacle of social complexity in the Southeastern United States. In north-central Mississippi this period is characterized by permanent settlements, maize agriculture and chiefdom level societies. Interaction with the Moundville chiefdom in northern Alabama is commonly noted in artifacts and residential patterning.

The Historic Period is represented by settlement in the region by Europeans, Euro-Americans, and African-Americans and the subsequent removal of Native American tribes. The first recorded European encounter with Native American groups in northern Mississippi by Europeans was Hernado de Soto's expedition in 1540. Continued excursions into the area by French, Spanish and English traders and explorers occurred during the 16th, 17th and 18th centuries. Clashes between the native Chickasaw and Europeans continued through the 18th century. The early 19th century saw their forced removal and by the late 1830s they had ceded their lands and most people had left the area. The first permanent Euro-American settlements occurred in the early 19th century, and by the removal of the Chickasaw the area was predominately occupied by Euro-Americans and African-Americans. Subsistence and cotton farming characterized the region from the Antebellum period to the early 20th century. Industrialization and urbanization has characterized the region in the late 20th century.

An archaeological survey of the area affected by the reservoir alternative including the water treatment plant site and the pipeline corridor identified 24 archaeological resources (Benyshek et al., 2000). Four potentially significant (i.e., potentially eligible for listing on the National Register of Historic Places) archaeological sites were identified within the proposed reservoir pool area. Ten additional archaeological sites or isolated find locations have unknown significance at this time due primarily to potential for deeply buried cultural deposits at these locations. These sites range in age from early/middle Archaic to Mississippian. A geomorphological study demonstrated there are extensive areas on the floodplain and some first terraces that contain buried deposits in the age range that could contain cultural remains, but were too deep to be assessed by the shovel testing methods used in this survey. There were also ten archaeological sites or isolated find locations that were considered ineligible for the National Register because of low density of artifacts, site disturbance from cultivation, and lack of potential for buried deposits. Further evaluation of potentially significant sites and sites of unknown significance will be conducted to determine preservation and data recovery needs.

Consultation with the Chief Archaeologist, Mississippi Department of Archives and History, indicates there are ten archaeological sites identified along the pipeline alternative corridor that are potentially eligible for the National Register of Historic Places, although no systematic survey has been conducted (McGahey, 2000)(see Appendix C-7).

TVA is mandated, under the NHPA of 1966, to protect significant archaeological resources located on land affected by TVA undertakings. NHPA Section 106 [16 U.S.C. 470f] requires Federal agencies prior to taking action to implement an undertaking (a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency), to:

1) take into account the effects of their undertaking on historic properties; and

2) Afford the and Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment regarding such undertaking. The determination that an action is an undertaking does not require knowledge that historic properties are present. An agency determines t hat a given proposal is an undertaking based solely on that proposal's inherent ability to affect historic properties. (The State Historic Preservation Office (SHPO) serves as a proxy to the ACHP and consultation will be initiated with the Mississippi SHPO concerning the project alternatives and any potential affects to archaeological resources.)

Actions that may have an adverse impact on archaeological resources include ground disturbing actions such as drilling for wells and transmission pipeline construction. In addition, shoreline erosion due to cyclical inundation and wave action associated with reservoir impoundments generally has an adverse effect on cultural resources.

Historic Structures and Sites

Historic structures include standing buildings and engineering structures such as bridges and dams that are generally more than 50 years old and have significant historical associations. Historic sites are locations where important historical events occurred but there are no material remains. Historic settlement of Union County began in the early 19th century and has continued until present. Currently, the Union County Courthouse in New Albany and the New Albany Historic District are listed on the National Register of Historic Places. Undoubtedly, additional historic structures and sites exist in the county.

The Tupelo National Battlefield commemorates the Battle of Tupelo. The Battlefield is administered by the National Park Service and is managed to preserve the historical resources and provide a quality recreational experience for visitors. The proposed pipeline would pass within about 3 miles of the battlefield.

An architectural survey of the multipurpose reservoir alternative identified two historic structures more than 50 years old within the area of potential effects (Benyshek et al., 2000). Both of these structures are preliminarily recommended as ineligible for the National Register of Historic Places because of alterations. Additional historic structures were identified during the survey and are being further evaluated to determine age and eligibility for the National Register of Historic Places.

3.10 LAND USE

Union County covers a total area of 270,080 acres (USDA, 1979). The largest incorporated municipality is New Albany; its city limits cover 6195 acres and have not changed in the last 10 years (Glenn Duckworth, personal communication). The other incorporated municipalities are the towns of Myrtle and Sherman, and the village of Blue Springs. The county outside city limits is not zoned. Land used for industrial, commercial, and residential purposes is located largely in the incorporated city limits of New Albany.

Table 3.10-1 lists the major land use classifications for Union County. Compared to the surrounding Southern Coastal Plain major land resource area, Union County has a somewhat lower proportion of forestland (53 percent vs. 69 percent) and a higher proportion of cropland and pastureland (45 percent vs. 28 percent) (USDA, 1979; EPA, 1994). As shown in Table 3.7-1, the area of forestland increased by about 15 percent between 1987 and 1994. Much of this increase was due to the establishment of pine plantations, which made up about a quarter of forestland in 1994. During the same period, the area of forestland owned by private individuals increased by 52,000 acres while the area of forestland owned by farmers decreased (Hartsell, 1995). Personal income generated by lumber and wood products increased from $260,000 in 1986 to $1,621,000 in 1997 (Bureau of Economic Analysis, 1997).

Table 3.10.1 Land Use In Union County, Mississippi

Land Use Classification*	Acres	%
Residential/ Industrial/Commercial/Built-up	2,934	1.0
Cropland/Pasture	120,676	44.7
Forestland	143,280	53.1
Transportation/Communication/Utilities	244	0.1
Reservoirs	869	0.3
Wetlands	2,077	0.8
Total	**270,080**	**100.0**

*Environmental Protection Agency's BASINS watershed database (EPA 1994)

About 6,000 acres of the Holly Springs National Forest are located in the extreme northwest corner of the county.

Agriculture Census data show that the land used for farmland increased by 1,860 acres in the decade from 1987-1997 (Table 3.10-2) (Oregon State University

1997). In the same time period, the active cropland decreased by 10,997 acres. The county-wide trend for the last 10 years is for fewer crops to be grown and more farmland to be used for woodland and pastureland. Woodland on the farms increased by 13,256 acres and pastureland increased by 2,939 acres. Even though cotton and soybean products are two of the county's major resources, production has decreased in the last 10 years. Cotton and wheat production has decreased by 79 percent, corn by 34 percent, and soybeans by 15 percent (Table 3.10.2) (Oregon State University, 1997).

Prime farmland, as defined by the U.S. Department of Agriculture, is land where the soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. They have properties needed for the economic production of sustained high yields of crops. Prime farmland soils may presently be in use as cropland, pasture land, range land, forest land, or other uses, but cannot be urban or built-up-land. The conversion of farmland and prime farmland soils to industrial and other nonagricultural uses essentially precludes farming the land in the foreseeable future. Recognizing the serious impacts on food and fiber production from such long-term land use trends, the Federal Farmland Protection Policy Act (FFPPA) was signed into law in 1981 (U.S. Code of Federal Regulations Title 7, paragraph 567). Amendments to FFPPA were subsequently made in 1984 and 1994 (7 CFR Part 658).

Table 3.10-2 Union County, Mississippi Agriculture Statistics For The Years 1987, 1992, And 1997

Agriculture Census Data*	1987 (acres)	1992 (acres)	1997 (acres)
Farmland	100,383	100,433	102,243
Harvested Cropland	44,135	43,029	33,138
Corn	4,973	6,882	3,262
Wheat	773	317	165
Cotton	9,348	7,594	1,942
Soybeans	22,886	19,827	19,441

*Source of Information: Oregon State University, 1997 (http:/govinfo.library.orst.edu/)

Of the 270,080 total acres in Union County, 104,696 acres (39 percent) are classified as prime farmland and an additional 34,464 acres (8 percent) are classified as farmland of local importance (USDA-SCS, 1979). According to the 1997 Agriculture Census, no more than 24 percent of the prime farmland and local important farmland are used for growing crops (Oregon State University, 1997).

3.10.1 Multipurpose Reservoir Site

Plans for a multipurpose reservoir include a water treatment plant, and a water transmission pipeline to deliver water from the reservoir to New Albany. Based on interpretation of the aerial photograph provided by the Union County Development Association, 56 percent of the 2,370 acres in the proposed reservoir area (here defined as the reservoir pool and the adjacent land within 500 ft of the flood pool elevation) is used for cropland and pasture (Table 3.10-3).

Undeveloped forestland covers about 942 acres, or 40 percent of the total site. The majority of the forestland is located on the perimeter of the proposed reservoir where the topography is steep or moderately sloping.

Soils in the proposed reservoir area which are classified as prime farmland soils are Arkabutla, Atwood, Bude, Cascilla, Jena, Mantachie, and Providence (see Table 3.1-2 and Figure 3.10-1). These soils have less than 5 percent slope and generally are well-drained. Atwood and Providence soils with 5 to 8 percent slope are classified as local important land. Prime farmland soils occupy 1284 acres (55 percent) of the reservoir area and an additional 306 acres (13 percent) is classified as local important farmland. The prime farmland soils are currently used primarily for growing corn and soybeans (47.8 percent), with some used for pasture/hay (26.5 percent). This agricultural utilization of prime farmland in the project area is 3 times higher than in the county as a whole.

There are about 68 acres in residential or farm buildings. No buildings are located within the water-supply pool area of the proposed reservoir; 1 building is within the flood pool area. Eight buildings occur within 250 ft of the flood pool perimeter, and 24 buildings occur between the 250 and 500 ft of the flood pool. CR 143 crosses through the reservoir pool area. Sections of CRs 140 and 139 are within the flood-pool area and sections of CRs 144 and 145 are within 500 ft of the flood pool perimeter. Tennessee Gas Company Transmission Pipeline crosses diagonally through the northern part of the reservoir basin and a TVA 161-kV transmission line traverses the length of the reservoir area.

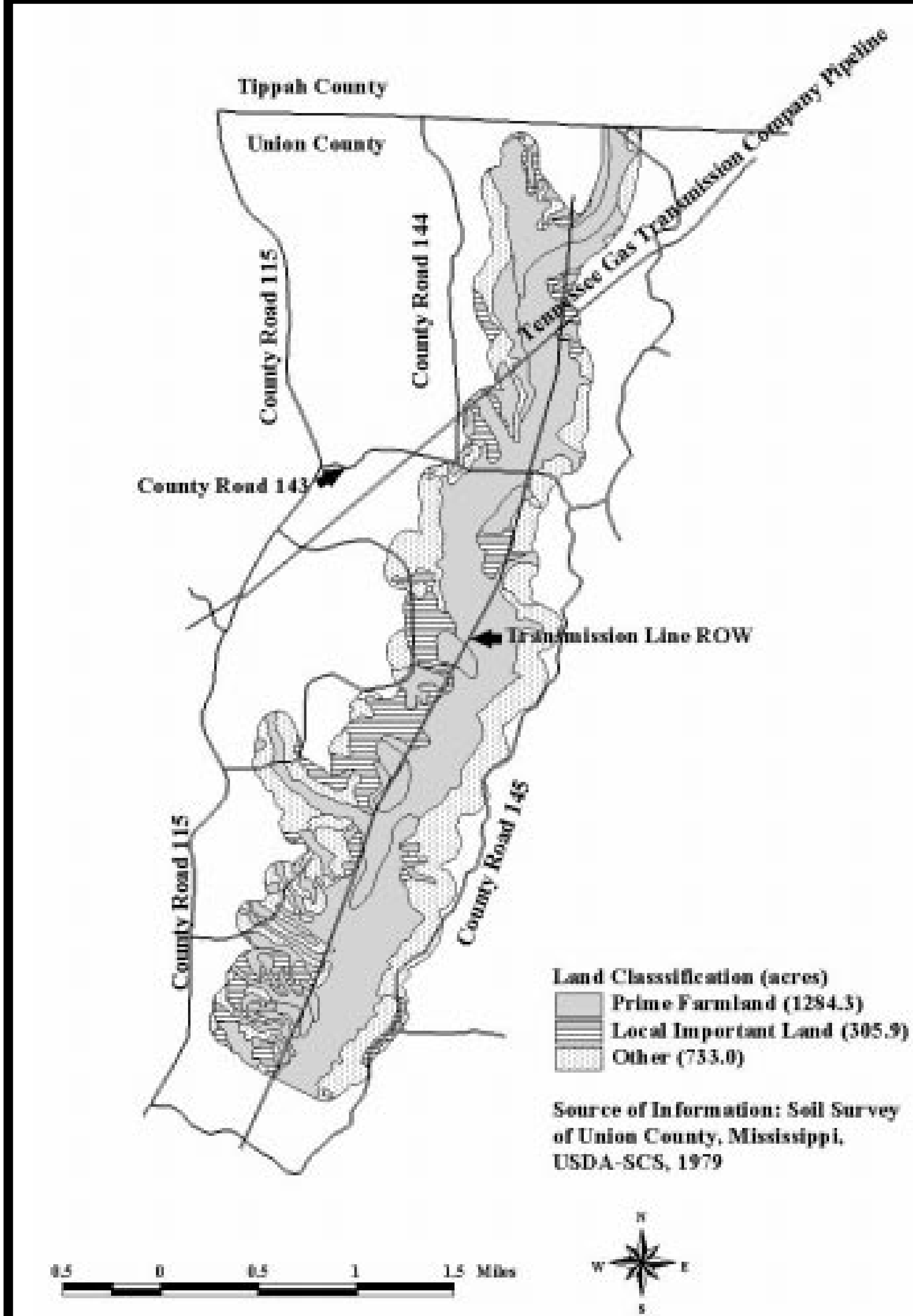
Table 3.10-3 Land Use Classifications Which Occur Within The Proposed Reservoir Project Area With Respective Acreage

Land Use Classification*	Acres	%
Residential/ Residential Farms/Farm Buildings	67.7	2.9
Cropland/Pasture		
Corn	408.8	17.4
Soybeans	212.1	9.1
Hay/Pasture	701.7	29.9
Forestland (undeveloped)	942.3	40.1
Reservoirs/Ponds	14.5	0.6
Total	**2347.0**	**100.0**

*Source of Information: Aerial Photograph provided by the Union County Development Association

Most of the area surrounding the proposed reservoir is sparsely populated. Residences are clustered along the southern half of CR 115 and along the southern portion of CR 137. The majority of the eastern perimeter of the reservoir area has a steep topography (12-40 percent slopes). There are sections of the western perimeter that have slopes from 17 - 35 percent. About half of this hilly land on the west is currently used for pasture. A small dairy is located at the junction of CR 115 and CR 143. A small amount of pasture adjoining the dairy is located within the reservoir area. Aerial photographs provided by the Union County

Figure 3.10-1 Location of Prime Farmland and Local Important Farmland on the Site for the Proposed Reservoir



Development Association show a proposed subdivision with 21 parcels which have the possibility of becoming water-front property if the reservoir is developed. These parcels are moderately level with slopes on the eastern boundary which would access the reservoir.

Water Treatment Facility and Pipeline

The 30-acre site for the proposed water treatment plant is located southeast of the proposed dam. This location is currently residential and pastureland with a small farm pond. About 42 percent of this site is prime farmland and another 30 percent is classified as local important farmland. The pipeline from the plant to New Albany would follow the northern and western ROWs of CR 137, CR 115, State Highway 15, Barkley Road, and Moss Hill Road. These ROWs travel through land used mostly for cropland and forested pastureland and across soils classified as prime farmland.

Transmission Line Routes

The Alternative 1 transmission line route starts at the existing transmission line at a point about 1200 ft south of CR 137, then crosses about 2.5 miles of cropland, then the remainder of the route is across forested, hilly terrain crossing CRs 137 and 143 to join the existing 161-kV transmission line about 600 ft south of the county line. The prime farmland soils located in this route cover about 27 acres. There are 17 acres classified as local important farmland. The total area of the proposed corridor is 78 acres.

The proposed corridor for the Alternative 2 route begins at the same point as Alternative 1, crosses about 2.5 miles of cropland, about 1 mile of forestland, then another 0.7 mile section of cropland before following the 500-kV transmission line ROW for about 1.7 miles. It then travels northwest about 1.7 miles through undeveloped forestland to the 161-kV transmission line. There are about 91 acres in this corridor, of which 36 acres are soils classified as prime farmland and 14 acres of local important farmland.

3.10.2 Pipeline from Existing Water Supply Sites

The proposed route for a pipeline connection from Tupelo would follow in the northeastern ROW of U. S. Highway 78 from the NEMRWSD to New Albany. Forestland comprises about 65 percent of the route, pasture/hayfields 19 percent, cropland 14 percent, and 2 percent residential. Prime farmland soils occupy about 62 percent of this ROW (EPA 1994).

3.10.3 Additional Groundwater Sources Sites

Under this alternative, new groundwater sources would be developed. Also, construction of water treatment facilities and pipelines connecting the new wells to existing distribution systems would be necessary. Because the sites for wells and associated facilities are unknown at this time, it is not possible to describe their land use and prime farmland characteristics.

3.11 RECREATION

The alternatives under consideration for this proposal include a broad geographic area of North Mississippi. The area encompassed by the proposed reservoir contains no public recreation facilities. The land surrounding Cane Creek is privately owned with the exception of public right of ways for utilities and roads. There is sporadic creek access by the public at these ROWs; however, there are no developed access facilities.

The majority of public recreation facilities in Union County are located in and near New Albany. Major facilities include the Sportsplex located adjacent to U. S. Highway 78 in New Albany, which features numerous sports fields and a nature area, and The Park Along the River in New Albany, which has nature trails, picnic facilities and playground equipment. Most other public recreation facilities in the county are associated with local governments or school systems.

There are several public lakes in the region. There are two State Fishing Lakes in the region including 330-acre Lake Lamar Bruce (30 miles East) and 165-acre Tippah County Lake (20 miles North). Both include boating, fishing, camping and playground facilities. Trace State Park (25 miles Southeast) includes the 600-acre Old Natchez Trace Lake. It is open year round and includes rental cabins, camping, trails, playground and water sports activities.

The USCOE manages four lakes in the region as well as recreation facilities along the Tennessee-Tombigbee Waterway. The four lakes are Sardis (30 miles west), Enid (50 miles southwest), Arkabutla (60 miles west), and Granada (70 miles southwest). These offer important lake-oriented recreational opportunities including camping, boating, fishing, hunting, hiking, and picnicking.

Other non-lake-oriented recreation opportunities in the region include the Hell Creek and Upper Sardis Wildlife Management Areas. The Hell Creek area is located about 4 miles northwest of the proposed reservoir. These are state areas that provide significant hunting and fishing opportunities subject to special seasons and regulations. The Holly Springs National Forest covers parts of six counties in North Mississippi and offers significant hunting, wildlife viewing, nature trails, fishing, hiking, and camping opportunities. The closest unit of the Forest is about 10 miles northwest of New Albany.

The Natchez Trace Parkway crosses U.S. Highway 78 on the west side of Tupelo. The Parkway, a unit of the National Park Service, is a 450 mile roadway established in 1938 to commemorate the original Natchez Trace, a primitive trail stretching through the wilderness from Natchez, Mississippi, to Nashville, Tennessee. Natural, cultural, and historic resources along the Trace are managed to provide quality recreation experiences for visitors. The Parkway is used for scenic drives, historical interpretation, camping, picnicking, hiking, biking, and bird-watching.

The Chickasaw-Blackbelt Prairie is immediately adjacent to the Natchez Trace Parkway about 2.5 miles north of U.S. Highway 78. The site is owned by the National Park Service and contains an interpretive center for American Indian history, and hiking and horseback riding trails. The site is being used as a demonstration area for a restoration project to restore the blackbelt prairie plant community.

3.12 AESTHETICS

The topography of the Union County area of northern Mississippi is gently rolling agricultural land broken by mixed timber stands of hardwood and pine.

3.12.1 Multipurpose Reservoir Site

The 3.5-mile portion of Cane Creek proposed to be inundated by the water supply pool (4.5 mi at flood pool) currently bisects near-level farm land. Minor drainways connect at various points with the deeply eroded channel of Cane Creek. Crops of soy beans and corn adjoining fields maintained for pasture can be seen from various points along county roads that pass around and through this area. A number of residents also have views of this farmland from their homes.

The land base surrounding the proposed reservoir for the most part is gently sloping on the west side and rather steep for the area on the eastern shoreline. Surrounding land in the general area of the proposed reservoir, but out of the pool area, is similar in composition. The upstream drainage basin of the Little Tallahatchie River lies less than a mile to the east of the site. A recently built, gas-fired electrical generating plant is located along CR 126 overlooking the Tallahatchie and Wilhite Creek basins. To the west, at a similar distance from the site, is State Highway 15 paralleled by the Mississippi and Tennessee Railnet. The closest industrial development to the reservoir site can be found along the Highway 15 corridor. The town of New Albany lies to the south of the proposed dam site approximately five miles away.

The New Albany-Ripley 161-kV transmission line currently runs from north to south through the existing Cane Creek drainage basin. Other local transmission lines can also be seen passing through the surrounding area. A section of 161-kV line will be relocated to one of two alternate routes to the east in the general vicinity of an existing 500-kV line and out of sight of the reservoir. The electrical generating plant is adjacent to the 500-kV line ROW.

Residences located in the immediate vicinity of the proposed reservoir and water treatment plant range from mobile homes and older small farmhouses to newer brick ranchers and larger homes. A few abandoned farmhouses and barns can be seen along the county roads that pass around and through the study area.

3.12.2 Pipeline from Existing Water Supply Sites

The topography that would be traversed in running a waterline from the NE Mississippi Water Supply District in Tupelo to New Albany is characteristic of the northeast Mississippi region. Generally, the pipeline would run parallel and along the north side of the four-lane Highway 78 ROW for a distance of approximately 25 miles. The majority of the necessary right-of-way would be through open countryside involving previously cleared agricultural land.

3.12.3 Additional Groundwater Source Sites

Location of new industries that require relatively heavy water supply needs would likely determine where additional groundwater sources will be sited. The New Albany portion of Union County, where additional groundwater source sites would likely occur, lies within the Little Tallahatchie watershed and is composed mostly of open agricultural land.

3.13 SOCIOECONOMICS

Alternatives being studied include regional solutions as well as actions confined primarily to Union County. Therefore, the analysis of socioeconomic impacts includes both Union County and a multi-county area of Northeast Mississippi which includes counties (Alcorn, Itawamba, Lee, Pontotoc, Prentiss, Tippah, Tishomingo, and Union) that would likely be considered as part of a regional solution.

3.13.1 Population

The population of Union County in 1998 is estimated to be 23,828, a 7.9 percent increase since 1990 (Table 3.13-1). This rate of increase is faster than that of the state, but somewhat slower than Northeast Mississippi and the Nation. In contrast, during the decade from 1980 to 1990, Union County grew more slowly than not only the State, but also Northeast Mississippi and the Nation. Projections indicate continued population growth for Union County. Two sets of projections were prepared for Union County. The first, labeled normal growth, is based on the assumption that the growth pattern of the last two decades continues. The high growth projections were developed to capture the likely impacts of continued development at the higher rates seen within the last few years. Under the normal growth scenario, Union County would have a population of 15.8 percent between 1998 and 2020 and 36.6 percent between 1998 and 2050. Under the high growth scenario, these rates would be 31.5 percent and 74.3 percent, respectively. For more detailed discussion of these projections and the methodology, see the report "Water Supply Needs Analysis for Union County, Mississippi" (TVA, 2000).

Table 3.13-1 Population						
Historical	**1980**	**1990**	**1998**	**Percent Increase 1980-90**	**Percent Increase 1990-98**	**Percent Increase 1980-98**
Union County	21,741	22,079	23,828	1.6	7.9	9.6
Northeast Mississippi*	214,472	222,124	241,630	3.6	8.8	12.7
Mississippi	2,520,638	2,575,475	2,752,092	2.2	6.9	9.2
United States (000's)	226,546	248,765	270,299	9.8	8.7	19.3
Projected	**2020**	**2030**	**2050**	**Percent Increase 1998-20**	**Percent Increase 1998-30**	**Percent Increase 1998-50**
Normal Growth:						
Union County	27,599	29,369	32,557	15.8	23.3	36.6
High Growth:						
Union County	31,332	34,732	41,532	31.5	45.8	74.3

*Northeast Mississippi is defined to include the following counties: Alcorn, Itawamba, Lee, Pontotoc, Prentiss, Tippah, Tishomingo, and Union.
Source: Historical: U. S. Bureau of the Census; Projections: Tennessee Valley Authority

3.13.2 Employment

In 1997, total employment in Union County was 11,342, while Northeast Mississippi reached an employment level of 141,255 (Table 3.13-2). Since 1979, employment in Union County has increased more slowly than in the Northeast Mississippi area, the State, and the Nation. However, in the more recent years, 1989-97, Union County has experienced faster employment growth than the Nation but slightly slower growth than Northeast Mississippi and the State.

Manufacturing employment in Union County and in Northeast Mississippi, at 32.5 percent in both areas, is a much larger share of the total than in the State (17.5 percent) or the Nation (12.4 percent) (Table 3.13-3). Since 1989, however, manufacturing's share has declined, as it has in the State and the Nation.

Both the normal growth and the high growth projections show continued growth in employment in Union County. (See Section 3.13.1 for discussion of the projections and reference for more detailed information.) Under the normal growth assumptions, total employment would increase by 27.8 percent from 1997 to 2020 and by 75.4 percent from 1997 to 2050. The high growth assumptions show much faster growth, at 56.7 percent from 1997 to 2020 and 129 percent from 1997 to 2050. Manufacturing employment would follow the national pattern and begin to decline after 2030 under the normal growth assumptions, although manufacturing output would not necessarily decline. Under the high growth assumption, manufacturing employment would continue to grow, increasing by 17.9 percent between 1997 and 2050.

Table 3.13-2 Employment (Total Number of Full- and Part-Time Jobs by Place of Work)						
Historical	**1979**	**1989**	**1997**	**Percent Increase 1979-89**	**Percent Increase 1989-97**	**Percent Increase 1979-97**
Union County	9,006	9,669	11,342	7.4	17.3	25.9
Northeast Mississippi	108,876	118,279	141,255	8.6	19.4	29.7
Mississippi	1,116,622	1,196,102	1,425,691	7.1	19.2	27.7
United States (000's)	113,288	137,318	156,410	21.2	13.9	38.1
Projected	**2020**	**2030**	**2050**	**Percent Increase 1997-20**	**Percent Increase 1997-30**	**Percent Increase 1997-50**
Normal Growth:						
Union County	14,495	16,388	19,898	27.8	44.5	75.4
High Growth:						
Union County	17,769	20,502	25,968	56.7	80.8	129.0

Northeast Mississippi is defined to include the following counties: Alcorn, Itawamba, Lee, Pontotoc, Prentiss, Tippah, Tishomingo, and Union.
Source: Historical: U. S. Bureau of Economic Analysis; Projections: Tennessee Valley Authority

Table 3.13-3 Manufacturing Employment (Full- and Part-Time by Place of Work)						
Historical	**1979**	**1989**	**1997**	**Percent of Total, 1979**	**Percent of Total, 1989**	**Percent of Total, 1997**
Union County	3,340	3,705	3,686	37.1	38.3	32.5
Northeast Mississippi	40,440	44,976	45,910	37.1	38.0	32.5
Mississippi	242,705	250,743	249,376	21.7	21.0	17.5
United States (000's)	21,497	19,998	19,416	19.0	14.6	12.4
Projected	**2020**	**2030**	**2050**	**Percent Increase 1997-20**	**Percent Increase 1997-30**	**Percent Increase 1997-50**
Normal Growth:						
Union County	3,849	3,782	3,456	4.4	2.6	- 6.2
High Growth:						
Union County	4,041	4,168	4,344	9.6	13.1	17.9

Northeast Mississippi is defined to include the following counties: Alcorn, Itawamba, Lee, Pontotoc, Prentiss, Tippah,
Tishomingo, and Union.
Source: Historical: U. S. Bureau of Economic Analysis; Projections: Tennessee Valley Authority

3.13.3 Income

In 1997, per capita personal income in Union County was $17,412, slightly lower than the Northeast Mississippi average of $18,219 (Table 3.13-4). The Union County average was lower than the State average while the Northeast Mississippi average was slightly higher than the State. All, however, were well below the

National average of $25,288. The Mississippi average was almost 72 percent of the National average while Northeast Mississippi's was 72 percent and Union County's about 69 percent.

Table 3.13-4 Per Capita Personal Income

	1979	1989	1997	Percent of Nation, 1979	Percent of Nation, 1989	Percent of Nation, 1997
Union County	5,838	11,685	17,412	64.0	64.4	68.9
Northeast Mississippi	6,256	12,069	18,219	68.6	66.5	72.0
Mississippi	6,426	11,996	18,098	70.5	66.1	71.6
United States (000's)	9,118	18,153	25,288	--	--	--

Northeast Mississippi is defined to include the following counties: Alcorn, Itawamba, Lee, Pontotoc, Prentiss, Tippah, Tishomingo, and Union.
Source: U. S. Bureau of Economic Analysis

3.13.4 Local Government Revenues

Union County receives revenues from two major sources: 1) ad valorem taxes and 2) intergovernmental revenues. During fiscal year 1999/2000 (FY 99/00), the county has budgeted a total of $8.65 million in revenue. Fifty-four percent of this amount would be from ad valorem tax sources, while 21 percent would come from revenues shared by the State and Federal governments. The remaining portion of county revenues (25 percent) would come from sources such as service charges, interest payments, fines and forfeitures, license and permit fees, and other miscellaneous sources.

The City of New Albany receives revenues from one major source: state shared sales tax revenues. In FY 99/00, New Albany has budgeted a total of $3.52 million in revenues. Fifty-five percent of this amount would be from sales tax revenues distributed by the State. The remaining 45 percent is generated from miscellaneous local collections, intergovernmental sources and interest income.

A total of 18.5 percent of sales tax revenue collected by the Mississippi State Tax Commission is returned to municipalities in which funds were collected. During FY 1998, approximately $1.76 million of sales tax proceeds were returned to municipalities within Union County. No sales tax proceeds are returned to Mississippi counties.

Mississippi school district revenues come primarily from intergovernmental sources. The Union County School District and New Albany Public School District have budgeted $11.5 million and $11.2 million, respectively, in revenues for FY 1999/2000.

3.13.5 Community Services

Water

There are 12 public water systems within Union County. These include two municipal water systems—City of New Albany and Town of Myrtle. The remaining ten are rural water associations which serve small and rural communities. In addition, small portions of Union County are served by seven public water systems based in adjacent counties. Also, the East Union, West Union, and Ingomar Schools each rely on their own water source to supply their daily needs.

Public water systems within Union County provide for an average daily demand of approximately 2.5 mgd. The City of New Albany Water System is the largest and provides over half of the total average daily demand within the county. All remaining systems are small with average daily demands of less than 250,000 gallons. According to the 1990 Census, 74 percent (6,750) of the housing units within Union County were on a public water system.

Groundwater is the primary source of water for all systems within the county. All of these systems except for Bethlehem Water Association use wells to supply groundwater. Bethlehem purchases water from the City of New Albany. None of the systems rely on surface water as their source of water supply.

Sewer

There are three municipal sewer systems serving portions of Union County: New Albany, Myrtle and Sherman. The City of New Albany operates the only wastewater treatment facility located within the county. The Town of Myrtle sends its wastewater to New Albany for treatment. Sherman (in neighboring Pontotoc County) has a collection system which extends into a portion of Union County. The New Albany wastewater treatment process consists of an oxidation ditch. According to the MDEQ, this facility is in compliance with federal and state effluent discharge requirements. Average daily flow at the New Albany facility for the past year was 1.9 mgd. The permitted capacity of the facility is 2.5 mgd.

Approximately one-third of the county's total population is served by public sewer. According to the 1990 U.S. Census, 35 percent (3,177) of the housing units within Union County were connected to public sewer and 65 percent relied on septic tanks or other means for sewage disposal.

3.13.6 Land Values

Market value of land varies with use, potential use, and location. The estimated market value (including land and buildings) of farmland per acre in Union County, according to the 1997 Census of Agriculture, was $756. According to the previous 1992 Census, the estimated market value was $684 per acre. According to the Union County Tax Assessor's Office in 1999, the estimated value of land within the vicinity of the proposed reservoir ranges from $1,000 to $2,000 per acre.

3.14 ENVIRONMENTAL JUSTICE

Northeast Mississippi has a much smaller minority population than the State as a whole, about 15 percent compared to about 37 percent statewide (Table 3.14-1). The proportion in Union County is very similar to that of Northeast Mississippi. Both Union County and Northeast Mississippi also have lower poverty rates than the State as a whole. However, there is considerable variation in both minority status and poverty rates among the Census tracts in Union County (Table 3.14-1). Census tracts are subcounty areas into which the Census Bureau divides counties for the purpose of enumeration, and for which data are reported.

Table 3.14-1 Population By Race And Hispanic Origin And By Poverty Level

	Population 1990	Percent White	Percent Nonwhite	Percent White, Hispanic Origin	Percent Below Poverty Level
Union County	22,085	85.1	14.9	0.3	16.4
Census Tract 9501	3,759	95.1	4.9	0.3	11.2
Census Tract 9502	3,547	94.1	5.9	0.5	11.4
Census Tract 9503	3,549	74.6	25.4	0.2	24.9
Census Tract 9504	4,025	68.5	31.5	0.3	19.5
Census Tract 9505	4,367	91.1	8.9	0.3	12.9
Census Tract 9506	2,838	88.4	11.6	0.1	19.9
Lee County	65,581	78.2	21.8	0.3	15.4
Census Tract 9504	6,628	68.9	31.1	0.1	10.7
Census Tract 9505	6,063	64.9	35.1	0.3	18.4
Census Tract 9506	6,590	89.6	10.4	0.4	9.6
Pontotoc County	22,237	85.1	14.9	0.2	17.2
Census Tract 9501	6,545	78.2	21.8	0.1	15.6
Northeast Mississippi	222,124	85.3	14.7	0.3	18.1
Mississippi	2,575,475	63.5	36.5	0.4	25.2

Source: U.S. Bureau of the Census, Census of Population 1990

3.15 TRANSPORTATION

The proposed reservoir would affect traffic on county roads in north-central Union county and in a small area of southern Tippah County (Figure 2.2-1). County roads are located in Union County unless otherwise noted. The county roads serve mostly as access to numerous parcels of land and for local residents to have access to CR 115 and State Route 15. State Route 15 is a paved two lane road north of New Albany, Mississippi and U.S. Highway 78, a four-lane divided highway providing a major link between Tupelo, Mississippi, and Memphis, Tennessee.

CR 115 is a paved road with surfacing varying from asphalt concrete to macadam. This road is a collector road serving the North Haven community and the City of New Albany on the south and as access into Tippah County on the north. Several county roads surround and/or traverse the area of the proposed reservoir. CR 137, leading off CR 115, is a two-lane macadam road located on the south end of the proposed reservoir. CR 145, leading north from CR 137 on the eastern side of the proposed reservoir, is a two-lane road in fair to poor condition serving a few residences. The road surface becomes hardpan (dirt) in poor condition with no housing in the area as it extends north to an intersection with CR 143. CR 139, leading off CR 115, is a macadam-paved dead-end road closed to through traffic. CR 140, leading off CR 115, is a paved macadam road off CR 115 changing to hardpan with some crushed stone surfacing as the road extends northward looping back to CR 115.

CR 143, leading off CR 115, includes a bridge across Cane Creek. This is a macadam paved road that provides access across Cane Creek. CR 143 extends northward into Tippah County becoming Tippah CR 725. At the Union/Tippah county line, there is a wooden bridge with no guard rails. Tippah CR 725 is hardpan with some crushed stone surfacing and intercepts Tippah CR 730 with two wooden bridges, each with no guard rails. Tippah CR 730 intersects Tippah CR 727. Southward, the road again enters Union County, becoming Union CR 144, a paved macadam road. All of these county roads are by their nature very low traffic volume roads.

The proposed pipeline from an existing water supply would run parallel to U.S. Highway 45 in Tupelo to its intersection with U.S. Highway 78, and then parallel to and north of U.S. Highway 78 for about 27 miles between Tupelo and New Albany. The Natchez Trace Parkway (see Section 3.11) crosses U.S. Highway 78 on the northwest side of Tupelo. U.S. Highway 45 is a four-lane divided highway running north and south through Tupelo. U.S. Highway 78 is an east/west four-lane divided highway across gently rolling land, traversing Lee, Pontotoc, and Union counties. The Mississippi and Tennessee Railnet railway crosses U.S. Highway 78 just west of the intersection of State Route 178 and U.S. Highway 78 near Tupelo, and crosses State Route 15 in New Albany.

Development of new groundwater sources could involve construction of pipelines in and around New Albany. This would require cut and cover operations along local roads with possible major highway crossings and/or railroad crossings depending on locations selected. Affected highways could include U.S. Highway 78, State highways 15, 30, 178, and 348, county roads in Union County, and streets within the City of New Albany. The Mississippi and Tennessee Railnet railroad line runs through New Albany.

3.16 NOISE

Noise is basically unwanted sound and, at high levels, noise can cause damage to hearing, sleep deprivation, communication interference, and disrupt concentration. Noise is measured logarithmically in "decibels" (dB). Due to its logarithmic scale, if a noise is increased 10 dB, it sounds as if the noise level has doubled. If a noise increases by 3 dB, the increase is just barely perceptible to humans. Often sound is measured as "A-weighted" (dBA), this filters out low frequency sounds which humans are unable to hear and is more indicative of the noise that we actually hear. The threshold of human hearing corresponds to a Sound Pressure Level (SPL) of 0, so while a noise can have a negative SPL, humans cannot hear it.

The existing noise levels at the proposed reservoir site are fairly typical of rural areas with background noise levels around 40 dBA. The existing noise levels along the proposed pipeline are significantly higher since it follows a highway and railroad tracks. Cars on the highway would likely produce noise levels of 72 to 75 dBA at 30 ft and trucks are expected to generate noise levels of 82 to 89 dBA at 30 ft. Trains generally produce about 85 to 88 dBA of noise at 30 ft. So the background noise along the propose pipeline would be fairly high.

3.17 AIR QUALITY

Mississippi has adopted the National Ambient Air Quality Standards, which establish safe concentration limits in the outside air for six pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. These standards are designed to protect public health and welfare. An area where any air quality standard is violated is designated as a non-attainment area for that pollutant, and emissions of that pollutant from new or expanding sources that could affect such an area are carefully controlled. No non-attainment areas currently exist in or near the Union County area. Therefore, air quality is considered to be good.

In addition, Mississippi has adopted Prevention of Significant Deterioration (PSD) regulations, which are used to limit air pollutant emissions from new or expanding sources. These regulations also protect national parks and wilderness areas that are designated PSD Class I air quality areas. A new or expanding major air pollutant source is required to estimate potential impact of its emissions on the air quality of any nearby Class I area, as specified by the State or local air regulatory agency, with input from the Federal Land Manager(s) having jurisdiction over the given Class I area(s). The closest PSD Class I area is the Sipsey National Wilderness Area in Alabama about 85 miles (137 kilometers) to the east of New Albany.