SECTION 5.0
EXISTING ENVIRONMENTAL CHARACTERISTICS OF PROJECT AREA

This section provides information on the current environmental conditions for the Project area including the site of the WRF, the force mains, pump stations, gravity sewer lines, and the Cape Fear River between Buckhorn Dam and Lock and Dam 3. The West Cary PS is currently under construction; a previous phase of that infrastructure was evaluated in a separate environmental assessment. Since all additional construction associated with this phase of the WCPS will occur within the structures currently under construction, no additional direct impacts will occur at that facility. Thus, the West Cary PS existing environment was not described in this EIS.

5.1 TOPOGRAPHY

5.1.1 Water Reclamation Facility

The Project Area includes 235 acres within the United States Geological Survey (USGS) Newhill 1:24,000 scale topographic map. Within this gently sloping area, elevations range from 250 feet to more than 340 feet above mean sea level (MSL) with a maximum of 344 feet MSL.

The project site contains several tributaries to White Oak Creek as described in the water resources section 5.10. A small portion of the unnamed tributaries (12.8 acres or 6.1 percent of project area) of the southern part of the project area are classified as Zone A floodplains (Wake County, 2005) as illustrated on Figure 5-1. Zone A is the 100-year floodplain that is approximated; detailed hydraulic analyses are not performed in these zones, and thus base flood elevations do not exist. No construction will occur within the floodplain.

5.1.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The transmission lines span a distance of approximately 24 miles from the West Cary PS down to the effluent outfall on the Cape Fear River. Over the course of the transmission lines there are various topographies. The pipeline leaving the West Cary PS travels upgradient from 262 ft to 324 ft, where it makes a southward turn into an area of rolling terrain typical of the piedmont physiographic region. The pipeline drops to 316 ft to enter the Beaver Creek PS. The BCPS site itself is sloped in a southern direction with elevations that range from 316 ft to 250 ft. The pipeline leaves the BCPS

at 316 ft, follows rolling terrain and finally enters the WRF at 318 ft. The effluent route leaves the WRF and enters a route corridor that covers an area from just above Old US 1 to just south of the CSX railroad (Figure 5-2). The width of this area spans approximately 300 to 1000 feet, with a total coverage of 139.1 acres. The Project Partners have chosen to present this section of the effluent line as a corridor to allow greater flexibility in the final pipeline routing through this area. Throughout the pipeline route corridor the topography oscillates from 328 ft down to 282 ft. This area falls along the watershed divide between Jordan and Harris Lake. The effluent line that will leave the pipeline corridor will pass through rolling terrain gradually falling to 154 ft at the effluent outfall site. The pipelines do not cross any named local landforms other than named streams which are described in Section 5.10.

Available GIS coverages of the FEMA floodplains (Federal Emergency Management Agency (FEMA). 2004. www.fema.gov/fhm. Accessed July 2004) were used to estimate current floodplain areas at the Beaver Creek PS site and all transmission lines. Figure 5-2 shows the Wake County FEMA floodplains along the length of the entire project area. For the effluent corridor section described above and illustrated on Figure 5-2, the entire corridor was used to evaluate existing conditions. For the remainder of the transmission lines, the easement width necessary for the installation and maintenance of the lines was used to assess the existing conditions. Easement widths were estimated based on guidance provided by the Town of Cary as described below. This methodology was used to evaluate the existing environment and the impacts described in Section 6.

Calculating Pipeline Easement Areas:

> The assumed easement width is based on the size of the pipe: a pipe from 18 to 48 inches requires an easement width of 40 feet and pipes greater than 48 inches require an easement width of 50 feet (Fisher, 2005). Where two adjacent pipes are required, a clear space of ten feet between the pipes has been provided. Therefore, if there was a need for a 36 inch and a 24 inch pipe, the pipes would each have a 20 foot width from the pipe centerline to the outside edge of the easement. There would be an additional 12.5 feet between the pipes (10 feet clear space between pipes and then the distance from the pipe centerline to the edge of the pipe). The total easement width would be 52.5 feet wide. This number was then rounded up to 54 feet since even widths provided easier spatial analysis of existing conditions, and the increase in easement widths ensured that no conditions were underestimated.

The following floodplains occur in the project areas:

- West Cary Regional PS to Beaver Creek Regional PS transmission line: 6.3 acres
- Beaver Creek Regional PS Site: 0.5 acres
- Beaver Creek PS to Western Wake WRF transmission line: 2.0 acres
- Western Wake WRF to outfall transmission line: There are existing floodplain acres within the project area for the transmission lines within this segment. The total number of acres within the project area could not be quantified due to the absence of digital floodplain data for Chatham County.
- Discharge Structure and associated pipeline: There are existing floodplain acres within the project area for the transmission lines within this segment. The total number of acres within the project area could not be quantified due to the lack of digital floodplain data for Chatham County.

5.2 SOILS

5.2.1 Water Reclamation Facility

Table 5-1 lists the soil types on the Project site according to the Wake County Soil Survey (United States Department of Agriculture (USDA), 1970). Creedmoor and White Store soils are the most prevalent. Creedmoor soils have slopes ranging from 2 to 20 percent. These strongly sloping, very deep, moderately well drained to somewhat poorly drained soils are located on uplands. They are formed in residuum from fine-grained Triassic material. They have a loamy surface layer and a clayey subsoil. Permeability is very slow and shrink-swell potential is high. The seasonal high water table is at a depth of 1.5 to 2.0 feet.

White Store soils are moderately steep, deep, moderately well drained soils located on uplands. They are formed in residuum from fine grained Triassic material. They have a loamy surface layer and a clayey subsoil. Permeability is very slow and the shrink-swell potential is very high. The seasonal high water table is at a depth of 1.0 to 1.5 feet.

The Wehadkee and Bibb and Worsham soils are the only hydric soils on the Project Site. The Wehadkee and Bibb soils are poorly drained with 0-4 percent slopes. Wehadkee soil has a surface of dark grayish brown to brown silt loam 3 to 12 inches thick, and the subsoil is gray to dark gray, friable sandy loam to silty clay loam 15 to 30 inches thick. Bibb soil has a surface grayish brown or very dark grayish brown of sandy loam 4 to 12 inches thick and the subsoil is varied in color and texture. The subsoil colors range from light brownish grey to black mottled with grey and brown, and the

texture ranges from loam to sandy loam. The combined thickness of this soil's surface and subsoil is more than 36 inches and surface runoff is slow to ponded. Infiltration is fair for Wehadkee and good for Bibb soils. Flooding and ponding are severe hazards and these soils are difficult to drain for cultivation of crops.

Worsham sandy loam soils are nearly level, very deep, poorly drained soils located along drainage ways and in slight depressions on uplands. They are formed in locally derived alluvium and residuum from felsic rock. They have a loamy surface layer and a clayey subsoil. Permeability is slow to very slow and the shrink-swell potential is moderate. The seasonal high water table is within a depth of 1.0 foot.

TABLE 5-1
Soil Types on the WRF Project Site

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	66.3	28.2%	S1	No
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	59.1	25.1%	P1	No
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	44.1	18.7%	NL	No
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	16.7	7.1%	S1	No
Wo	Wehadkee and Bibb	16.0	6.8%	NL	Yes
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	11.9	5.1%	NL	No
WsE	White Store sandy loam, 10 to 20 percent slopes	8.8	3.8%	NL	No
Wy	Worsham sandy loam	7.8	3.3%	NL	Yes
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	3.5	1.5%	P1	No
WvD3	White Store clay loam, 2 to 15 percent slopes, severely eroded	1.1	0.5%	NL	No
		235.3	100%		

P1=All areas are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

5.2.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

Table 5-2 lists the soil types on the Beaver Creek PS site and transmission line sites according to the Wake County Soil Survey (USDA, 1970). The acreages were estimated based on the easement areas necessary for the proposed transmission lines,

as well as the pipeline route corridor. Chatham County soils data are not available in digital format; a review of available data indicates that soils types are similar to those in Wake County.

Creedmoor, White Store and Augusta soils are the most prevalent. Creedmoor soils have slopes ranging from 2 to 20 percent. These strongly sloping, very deep, moderately well drained to somewhat poorly drained soils are located on uplands. They are formed in residuum from fine-grained Triassic material. They have a loamy surface layer and a clayey subsoil. Permeability is very slow and shrink-swell potential is high. The seasonal high water table is at a depth of 1.5 to 2.0 feet.

TABLE 5-2A
Soil Types along Transmission Line from West Cary PS to Beaver Creek Pump Station

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	9.7	20.2%	P1	No
Wo	Wehadkee and Bibb	8.1	16.9%	NL	Yes
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	7.3	15.2%	S1	No
Au	Augusta fine sandy loam	7.1	14.8%	P2	Yes
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	3.0	6.3%	NL	No
AfA	Altavista fine sandy loam, 0 to 4 percent slopes	2.7	5.6%	P1	Yes
Wn	Wehadke silt loam	2.2	4.6%	NL	Yes
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	1.3	2.7%	S1	No
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	1.2	2.5%	NL	No
Wy	Worsham sandy loam	1.1	2.3%	NL	Yes
Cm	Chewacla	1.0	2.1%	P5	Yes
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	0.9	1.9%	P1	No
MfC2	Myodan sandy loam, 6 to 10 percent slopes, eroded	0.6	1.3%	S1	No
CrC	Creedmoor sandy loam, 6 to 10 percent slopes	0.5	1.0%	S1	No
GrC2	Granville sandy loam, 6 to 10 percent slopes, eroded	0.4	0.8%	S1	No
WsE	White Store sandy loam, 10 to 20 percent slopes	0.3	0.6%	NL	No
GrC	Granville sandy loam, 6 to 10 percent slopes	0.2	0.4%	S1	No
Bu	Buncombe	0.1	0.2%	NL	Yes
MfE	Myodan sandy loam, 15 to 25 percent slopes	0.1	0.2%	NL	No
Cp	Congaree silt loam	>0.1	>0.1%	P3	No
Cn	Colfax Sandy Loam	>0.1	>0.1%	S1	Yes
Ro	Roanoke fine sandy loam	>0.1	>0.1%	S2	Yes
		48.0	100%		

P1=All areas are prime farmland
P2=Only drained areas are prime farmland
P5=Only drained areas not protected from flooding or not frequently flooded during the growing season are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

TABLE 5-2B
Soil Types at Beaver Creek Pump Station

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	9.2	29.2%	S1	No
GrC2	Granville sandy loam, 6 to 10 percent slopes, eroded	8.4	26.7%	S1	No
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	5.3	16.8%	P1	No
Au	Augusta fine sandy loam	4.4	14.0%	P2	Yes
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	3.9	12.4%	NL	No
w	Water	0.3	1.0%	NL	No
		31.5	100%		

P1=All areas are prime farmland
P2=Only drained areas are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

TABLE 5-2C
Soil Types along Transmission Line from Beaver Creek Pump Station to WRF

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	9.0	30.7%	P1	No
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	5.3	18.1%	S1	No
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	3.6	12.3%	NL	No
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	3.5	11.9%	S1	No
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	2.3	7.8%	P1	No
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	1.3	4.4%	NL	No
Wy	Worsham sandy loam	1.3	4.4%	NL	Yes
Au	Augusta fine sandy loam	1.2	4.1%	P2	Yes
Wn	Wehadke silt loam	0.7	2.4%	NL	Yes
WsE	White Store sandy loam, 10 to 20 percent slopes	0.4	1.4%	NL	No
Cm	Chewacla	0.4	1.4%	P5	Yes
Wo	Wehadkee and Bibb	0.1	0.3%	NL	Yes
WvD3	White Store clay loam, 2 to 15 percent slopes, severely eroded	>0.1	>0.3%	NL	No
GrB	Granville sandy loam, 2 to 6 percent slopes	>0.1	>0.3%	P1	No
		29.3	100%		

P1=All areas are prime farmland
P2=Only drained areas are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

TABLE 5-2 D
Soil Types along Transmission Line from WRF through Pipeline Route Corridor (NOTE: This data does not include soils for the portions of the line in Chatham County; digital soils data is not available.)

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	42.6	30.6%	P1	No
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	30.7	22.1%	S1	No
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	11.1	8.0%	NL	No
WsB	White Store sandy loam, 2 to 6 percent slopes	4.9	3.5%	S1	No
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	4.3	3.1%	S1	No
Wo	Wehadkee and Bibb	4.2	3.0%	NL	Yes
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	2.6	1.9%	P1	No
w	Water	2.0	1.4%	NL	No
Wy	Worsham sandy loam	1.7	1.2%	NL	Yes
WsE	White Store sandy loam, 10 to 20 percent slopes	0.9	0.7%	NL	No
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	0.7	0.5%	NL	No
GrB2	Granville sandy loam, 2 to 6 percent slopes, eroded	0.35	0.3%	P1	No
	Chatham County soils	33.0	23.7%		
		139.1	100%		

P1=All areas are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

TABLE 5-2 E
Soil Types along Transmission Line from Pipeline Route Corridor to Discharge Structure (NOTE: This data does not include soils for the portions of the line in Chatham County; digital soils data is not available.)

Soil Type	Description	Acres	Percent of site	Prime Farmland	Hydric
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	2.3	3.7%	NL	No
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	2.2	3.6%	S1	No
WsB	White Store sandy loam, 2 to 6 percent slopes	1.2	1.9%	S1	No
Wy	Worsham sandy loam	0.1	0.2%	NL	Yes
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	0.1	0.2%	P1	No
	Chatham County soils	56.0	90.4		
		62.0	100%		

P1=All areas are prime farmland
S1= All areas are farmland of state wide importance
NL = Not listed
Source: NCCGIA, BasinPro version 8

White Store soils are moderately steep, deep, moderately well drained soils located on uplands. They are formed in residuum from fine grained Triassic material. They have a loamy surface layer and a clayey subsoil. Permeability is very slow and the shrink-swell potential is very high. The seasonal high water table is at a depth of 1.0 and 1.5 feet.

Augusta soils are nearly level to gently sloping that are deep and usually poorly drained. These strongly acidic soils are formed in alluvial deposits under forest and are found on low stream terraces near large streams. The shrink swell potential is moderate and can be frequently flooded.

Several soils found in the project area for the pump station and transmission lines are hydric. Primarily these soils are Augusta and Worsham.

Worsham sandy loam soils are nearly level, very deep, poorly drained soils located along drainage ways and in slight depressions on uplands. They are formed in locally derived alluvium and residuum from felsic rock. They have a loamy surface layer and a clayey subsoil. Permeability is slow to very slow and the shrink-swell potential is moderate. The seasonal high water table is within a depth of 1.0 foot.

5.3 LAND USE

5.3.1 Zoning

5.3.1.1 Water Reclamation Facility (WRF)

The WRF is located in Wake County's jurisdiction but is in the Town of Apex's planning area and urban service area. The WRF site is currently zoned as an R-30 residential district. The surrounding areas adjacent to the WRF parcel are also zoned residential. Areas adjacent to the WRF parcel to the west and east are zoned R-30. Areas to the north of Old US-1 are zoned R-40W, and the area south of US-1 is zoned R-80 (Wake County GIS).

5.3.1.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

Existing zoning over the length of the transmission lines in Wake County and at the Beaver Creek Pump Station were estimated using digital data provided by the Town of Apex and Wake County (Wake County GIS). Zoning in Chatham County for effluent transmission lines was roughly estimated using pipeline easement areas and relative locations on zoning maps included in the Chatham County zoning ordinance.

The Beaver Creek PS location is zoned as an R-80W residential watershed district. The primary existing zoning along the length of the transmission lines in Wake County is R-40W (41%) and R-80W (28%). The transmission lines will also pass through areas that have been zoned R-30, R-80, HD, HC, and GB in Wake County's jurisdiction and MD and RA in the Town of Apex's jurisdiction. The effluent line passes through an area zoned as a heavy industrial district (IND-H), as well as zoning areas RA-40 and RA-5 in Chatham County. Table 5-3 summarizes the existing acreage and percentage of zoning that falls within the pipeline easement area along the length of the transmission lines.

TABLE 5-3
Zoning Along Transmission Lines

Description	Acres		Percent of Site
Zoning Along Transmission Line between W. Cary PS and BCPS			
	Wake	**Apex**	
R-80W (Residential 80 Watershed District)	21.8		45.3%
R-40W (Residential 40 Watershed District)	16.5		34.3%
HD (Highway District)	2.4		5.0%
GB (General Business District)	0.1		0.2%
MD (Medium Density Residential District)		5.8	12.3%
RA (Residential-Agriculture District)		1.4	2.9%
	40.8	7.2	100%
Zoning from Beaver Creek PS to WRF			
	Wake		
R-40W (Residential 40 Watershed District)	21.7		74.1%
R-80W (Residential 80 Watershed District)	4.7		16.0%
R-30 (Residential 30 District)	2.7		9.2%
HC (Heavy Commercial District)	0.1		0.3%
GB (General Business District)	>0.1		>0.3%
	29.3		100%
Zoning within Pipeline Route Corridor			
	Wake	**Chatham**	
R-30 (Residential 30 District)	51.6		37.1%
HC (Heavy Commercial District)	28.9		20.7%
R-40W (Residential 40 Watershed District)	16.6		11.9%
R-80W (Residential 80 Watershed District)	8.5		6.1%
RA-40 (Residential 40 District with agriculture)		33.6*	24.2%
	105.5	33.6*	100.0%
Zoning from Pipeline Route Corridor to Outfall			
	Wake	**Chatham**	
R-80 (Residential 80 District)	5.2		8.4%
RA-40 (Residential 40 District with agriculture)		51.8*	83.5%
RA-5 (Low Density Residential district along county rivers)		2.8*	4.5%
IND-H (Heavy Industrial District)		2.2*	3.6%
	5.2	56.8*	100%
Zoning for Discharge Structure and Pipeline			
	Wake	**Chatham**	
RA-5 (Low Density Residential district along county rivers)		2.5*	100%

* Data estimated from a paper map in the Chatham County Zoning Ordinance

5.3.2 **Land Cover**

5.3.2.1 Water Reclamation Facility

Site visits, aerial photography and GIS information provided by the County's webpage (Wake County, 2005) were used to summarize land cover. The project area contains a number of cover types including managed herbaceous cover, forest, and some hardwood swamps (CGIA, 2004). Table 5-4 summarizes the available land cover data. There are currently several structures (two unoccupied houses and one barn) and two ponds on the WRF project site. The forest types are discussed in Section 5.12, and illustrated in the aerial photograph (Figure 5-1) and Figure 5-3.

TABLE 5-4
Land Cover at WRF Site

Description	Acres	Percentage of site
Southern Yellow Pine	142.6	60.6%
Mixed Hardwoods/Conifers	66.9	28.4%
Managed Herbaceous Cover	14.6	6.2%
Mixed Upland Hardwoods	9.6	4.1%
Water Bodies	1.6	0.7%
	235.3	100%

5.3.2.2 Force Main, Gravity Sewers, Pump Stations, and Effluent Transmission Mains

Existing land cover at the Beaver Creek PS site and along the transmission lines was estimated using data available through CGIA. Pipeline easement areas were used in these calculations. From the West Cary Regional PS to the Beaver Creek Pump Station, the majority of the land is in southern yellow pine and mixed hardwoods/conifers. These two land use categories comprise over 75 percent of the transmission line route as shown in Table 5-5. According to the available data, land cover at the Beaver Creek PS is comprised mostly of managed herbaceous cover (58 percent) with bottomland hardwood forest (25.1 percent, Table 5-5). The landowner's primary use for this site is pasture land for cattle and horse grazing.

TABLE 5-5
Land Cover at Beaver Creek PS and Along Transmission Lines

Description	Acres	Percentage of Site
Land Cover Along Transmission Line between W. Cary PS and Beaver Creek PS		
Mixed Hardwoods/Conifers	15.3	31.9%
Southern Yellow Pine	14.6	30.4%
Bottomland Forest/Hardwood Swamps	11.3	23.5%
Managed Herbaceous Cover	5.4	11.3%
Low Intensity Developed	1.2	2.5%
High Intensity Developed	0.2	0.4%
	48.0	100%
Land Cover at Beaver Creek Pump Station		
Managed Herbaceous Cover	18.3	58.1%
Bottomland Forest/Hardwood Swamps	7.9	25.1%
Southern Yellow Pine	4.7	14.9%
Mixed Hardwoods/Conifers	0.6	1.9%
Total	31.5	100%
Land Cover from Beaver Creek PS to WRF		
Southern Yellow Pine	13.7	46.8%
Mixed Hardwood/Conifers	7.9	27.0%
Managed Herbaceous Cover	3.9	13.3%
Bottomland Forest/Hardwood Swamp	2.7	9.2%
Deciduous Shrubland	0.6	2.0%
Evergreen Shrubland	0.3	1.0%
Water Bodies	0.2	0.7%
Total	29.3	100%
Land Cover from WRF through Pipeline Route Corridor		
Southern Yellow Pine	92.9	66.8%
Mixed Hardwoods/Conifers	35.2	25.3%
Bottomland Forest/Hardwood Swamps	5.6	4.0%
Unconsolidated Sediment	2.5	1.8%
Water Bodies	2.2	1.6%
Managed Herbaceous Cover	0.6	0.4%
Deciduous Shrubland	0.1	0.1%
Evergreen Shrubland	>0.1	>0.1%
	139.1	100%

TABLE 5-5
Land Cover at Beaver Creek PS and Along Transmission Lines

Land Cover from Pipeline Route Corridor to Discharge Structure		
Southern Yellow Pine	39.9	64.4%
Mixed Hardwoods/Conifers	12.3	19.8%
Bottomland Forest/Hardwood Swamps	6.9	11.1%
Managed Herbaceous Cover	1.8	2.9%
Evergreen Shrubland	0.9	1.5%
High Intensity Developed	0.2	0.3%
	62.0	100%

Land Cover from Discharge Structure to Outfall		
Bottomland Forest/Hardwood Swamps	1.9	76.0%
Waterbodies	0.6	24.0%
	2.5	100%

Land cover within the project area for the transmission lines from the West Cary Pump Station to the WRF is comparable in the dominant cover type along the effluent route: southern yellow pine (37 & 66 percent respectively) and mixed hardwoods (30 & 24 percent respectively). Land cover for the Discharge structure and pipeline to the diffuser (located in the Cape Fear River) is primarily bottomland forest/ hardwood swamps. Initial field visits indicated that much of this area is a floodplain area consisting of mainly bottomland hardwood forest.

5.4 WETLANDS

According to the U.S. Environmental Protection Agency (EPA), wetlands are lands in transition between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at least part of the year. For regulatory purposes under the Clean Water Act, the term wetlands means “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” In general, wetlands share three key characteristics: wetland hydrology, hydric soils, and hydrophytic plants. Wetlands and vegetated riparian areas are valuable because they are biologically productive natural ecosystems, provide wildlife habitat, protect water quality, control erosion, and prevent flooding damage. Wetlands were delineated at the WRF site in accordance with the USACE 1987 Wetlands Delineation Manual. At pump stations and

along transmission lines, estimates of existing wetland conditions were made based on a combination of hydric soils, and the national wetlands inventory (NWI) wetlands. Wetland delineations at the pump station and along the transmission lines will occur during the final design phase when access to the private property along the final line route is obtained. The final design will use the results of the wetlands delineation and field observations to minimize impacts to wetlands and other important environmental features observed.

5.4.1 Water Reclamation Facility

A USACE jurisdictional wetland determination found a total of 5.9 acres of wetlands at the WRF site. The jurisdictional wetlands located at the WRF site are shown on Figure 5-1. The locations are exact, from an actual survey and the figure provides information on the size of each individual wetland area.

The primary wetland types at the WRF site are forested hardwood wetlands, headwater forested wetlands, and open water. The "Guidance for Rating the Values of Wetlands in North Carolina" (NCDENR, 1995) was used to qualitatively assess the relative quality of each wetland at the WRF site. Each of the wetland types provides the following primary functions: wildlife habitat and the support of aquatic life. Wetland areas within the northern portion of the WRF site provide limited water storage and pollutant removal, due to their small size and location at the top of the watershed. Wetland areas in the southern portion of the site receive more drainage and therefore will provide greater amounts of water storage and pollutant removal (Figure 5-1). Due to their individual size, location, and the lack of on-site disturbance, the opportunity for these wetlands to provide water storage and pollutant removal for the watershed is low. Therefore using the NCDENR wetland rating system these wetlands would not be considered high quality; however, they do provide beneficial hydrologic and biological function within the watershed.

5.4.2 Force Main, Gravity Sewers, Pump Stations, and Effluent Transmission Mains

Data from the Wake County Soil Survey (USDA, 1970) and the NWI (NCCGIA BasinPro version 8) were used to quantify the amount of wetlands affected by the project. Figure 5-2 displays the hydric soils and NWI sites along the length of the entire project area. Table 5-6 summarizes the existing wetlands along the transmission lines based on these data sources using pipeline easement areas and the pipeline route corridor to describe the existing wetland conditions. The hydric soils are usually a good indicator of

wetland areas. Information gathered during site visits to the proposed Beaver Creek PS site indicates that the wetlands generally follow the hydric soils data available. The majority of wetlands along the pipeline routes and within the pipeline route corridor are associated with streams and would be considered vital riparian wetlands with high connectivity to surface waters. A USACE jurisdictional wetland determination will be conducted as part of the final design for the transmission lines, the Beaver Creek PS, and the discharge structure. The wetland delineation will be necessary prior to applying for DWQ permits.

TABLE 5-6
Existing Wetlands Along Transmission Line Routes

	No. acres of Wetlands	
Transmission Line	**Hydric Soils**	**NWI**
West Cary PS to Beaver Creek PS	22.5	14.8
Beaver Creek PS	4.4	0.2
Beaver Creek PS to WRF	4.8	2.0
Pipeline Route Corridor	6.0*	2.2
Pipeline Route Corridor to Discharge Structure	0.1*	2.5
Discharge Structure to Cape Fear River	----*	1.8

* hydric soils not available digitally for Chatham County

5.5 PRIME OR UNIQUE AGRICULTURAL LANDS

North Carolina Executive Order 96 charges all state agencies to minimize the loss of prime agricultural and forested lands as defined in the Federal Farmland Protection Policy Act. The USDA Natural Resources Conservation Service (NRCS) has classified lands into three categories based on suitability for agricultural uses. These classifications incorporate soil type, slope, and water capacity. Prime farmlands (PFL) are those soils with slopes between zero and 8 percent in capability classes I and II, and some in capability class III. Unique farmlands are recognized for having a certain set of parameters necessary to produce certain high-value crops. The third category, farmland of statewide importance, includes those soils that do not quite qualify as PFL. Factors include steepness of slope, susceptibility to erosion, and permeability (USDA, 1970).

5.5.1 Water Reclamation Facility

Of the soil types within the Project site area, Creedmoor and White Store are listed as PFL (USDA, 1970). Both federal prime farmland and soils of statewide importance are summarized in Table 5-1. While almost 60 percent of the soils in the project site area are classified as either federal or state farmlands, little of the area (6.2 percent) is

currently under tillage. The 14.6 acres that are under tillage are a managed herbaceous cover (CGIA, 2004).

5.5.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

As illustrated in Table 5-2, there are prime farmland soils at the Beaver Creek PS and along the transmission lines. The Beaver Creek PS site contains 16.8 acres of prime farmland soils and 21.5 acres of farmlands of statewide importance. The greatest area of prime farmlands that occurs within the easement area for the transmission lines is from the West Cary PS to the Beaver Creek PS (21.5 acres). State significant farmlands add an additional 10.4 acres along this line.

The pipeline route corridor area contains a total of 45.5 acres of prime farmland soils and an additional 39.8 acres of farmlands of state importance. The remainder of the effluent line route contains 3.5 acres of soils that are prime farmland or farmland of statewide importance (soil acreages discussed in this paragraph do not including information on prime or state significant farmland soils in Chatham County due to the lack of digital soil data).

5.6 PUBLIC LANDS AND SCENIC, RECREATIONAL, AND STATE NATURAL AREAS

This category includes federal, state and local parks, and other scenic and recreational areas.

5.6.1 Water Reclamation Facility

No parks, recreation areas or other public lands occur on the WRF site, but there are 24.6 acres of WRC gamelands on the western parcel of the site where a roadway to the WRF will be located. This parcel is currently owned by Progress Energy. Jordan Lake, WRC Gamelands, and a section of the American Tobacco trail occur within a 1-mile radius of the WRF area. The American Tobacco Trail is used for biking, walking, and horseback riding. When complete, the trail will connect western Wake County to downtown Durham. In addition, areas within a 5-mile radius include Harris Lake and several significant natural heritage areas (SNHA) shown in Figure 5-4. SNHAs have been designated by the North Carolina Natural Heritage Program (NHP) as areas of unique habitat. The Shearon Harris Game Lands, leased by Progress Energy, provide hunting opportunities. Figure 5-4 illustrates the location of recreation areas, public lands, and Significant Natural Heritage Areas within 5 miles of the Project site.

5.6.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The transmission lines and Beaver Creek PS are near Wildlife Resources Commission gamelands and the American Tobacco Trail. Figure 5-4 shows the approximate locations of these resources relative to the transmission lines. Table 5-7 includes parks within a 5 mile radius of the WRF, Beaver Creek PS and the transmission lines.

TABLE 5-7
Public Parks Within a 5-mile Radius of the Project Area

Park	Total Acres	Acres within 5 mi of Project Area	Owner
Jordan Lake Game Lands	39,675	19,244	USACE
Shearon Harris Game Lands	15,844	15,694	Progress Energy
Shearon Harris County Park	593	593	Wake County
Bond Park	273	228	Town of Cary
Tom Brooks Park	201	201	Town of Cary
Apex Community Park	163	163	Town of Apex
American Tobacco Trail	144	144	Wake Co
American Tobacco Trail Park	115	115	Wake County & Town of Cary
Morrisville Commerce Park	35	35	Town of Morrisville
Kelly Road Park	27	27	Town of Apex
Jaycee Park	23	23	Town of Apex
MacArthur park	17	17	Town of Cary
Davis Drive Park	13	13	Wake County
Sears Farm Rd Park	13	13	Town of Cary
Cary Village Park	12	12	Town of Cary
White Oak Park	11	11	Town of Cary
Jonas Park	6	6	Town of Apex
Apex Elementary School Park	5	5	Town of Apex
Apex Senior Citizens Park	2	2	Town of Apex
Clairmont Neighborhood Park	1	1	Town of Apex
Whops Park	1	1	Town of Apex
West Street Park	1	1	Town of Apex
Total	**57,175**	**36,549**	

Source: NCCGIA, BasinPro version 8, Wake Co GIS 2005

5.7 AREAS OF ARCHAEOLOGICAL OR HISTORIC VALUE

The North Carolina Environmental Policy Act (NCEPA) requires the conservation and protection of the state's natural resources and preservation of "the important historic and cultural elements of our common inheritance." The National Register of Historic Places (NRHP) is the formal repository of information pertaining to historic structures and districts. Places considered for listing include historic structures and districts, cemeteries, and archeological sites. Properties included on the NRHP or on the study list are shown on Figures 5-5 and Figure 5-6.

5.7.1 Water Reclamation Facility

An archaeological survey of the WRF site was performed by Brockington and Associates. They identified one isolated find of a prehistoric metavolcanic flake and the remains of an early 20th century domestic structure with a corresponding well. The located resources were determined to not be significant (Jenkins and Pattison, 2005). An investigation of existing recognized historic structures and districts at the State Historic Preservation Office (SHPO) found that within 1 mile of the WRF site there is a NRHP listed historic district (New Hill Historic District, Figure 5-5). There were also three structures that were on the State Study List for potential eligibility for nomination to the NRHP; the structures included the Allie Lawrence House, New Hill Baptist Church, and the New Hill First Missionary Baptist Church (Figure 5-6).

5.7.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

Brockington and Associates also surveyed the outfall site including the discharge structure location. One previously recorded archaeological resource listed by the North Carolina Office of State Archaeology is within the Outfall site, this resource is not eligible for the NRHP (Brockington and Associates, 2005). Three other previously identified archaeological resources within 1 mile of the planned wastewater infrastructure are either not eligible, were not investigated, or further work is necessary for the determination of eligibility for an NHRP listing.

A review of historic sites within 1 mile of the Beaver Creek PS identified two sites listed on the National Historic Register Study List (H.T. Lawrence Farm and the Callie Lawrence House, Wake County; Figure 5-5). Four other Study List sites were found to be within 1 mile of the proposed wastewater transmission lines; these sites include: the Green Level Baptist Church and Cemetery, the Green Level Historic District, J.M. Williams Farm, and the H.T. Lawrence Farm (Figure 5-6). The New Ruin Tavern is not on the study list, but local residents have expressed interest in the historic value of the property. SHPO may be studying this site in more detail.

5.8 AIR QUALITY

The EPA uses the Air Quality Index (AQI) to report ambient air quality conditions, and the AQI ranges from good (green), moderate (yellow), unhealthy for sensitive groups (orange), unhealthy (red), to hazardous (purple).

Since air quality information is available for more general areas, the existing environment for the water reclamation facility, force mains, pump stations, and gravity

sewer lines have been combined. In 2002, the median AQI in Wake County was 45, or good. In 2002, 2 days were considered unhealthy and 5 days were considered unhealthful for sensitive populations (DENR, 2004a). In 2003, 2 unhealthy days were reported in the Triangle region, and 28 days were reported as unhealthful for sensitive populations. In 2004, no unhealthy days were reported in the Triangle region, and only 1 day was reported as unhealthful for sensitive populations (NCDAQ, 2005).

A more stringent National Ambient Air Quality Standard (NAAQS) for ozone was established by USEPA in 1997. The 8-hour standard is set at 0.08 parts per million (ppm) and the 1-hour standard is 0.12 ppm. The Raleigh-Durham-Chapel Hill region has had difficulty in meeting this new standard (USEPA, 2004). Ozone is not directly emitted, but is formed when sunlight reacts with volatile organic compounds (VOCs) and nitrogen oxides (NOx) and is a component of smog. The largest source of the precursors to the formation of ozone in the Planning Area is motor vehicles. Wake County is currently listed in nonattainment for the 8-hour ozone standard. The County is also listed as a maintenance area for carbon monoxide (CO), which is primarily emitted from transportation and industrial sources.

5.9 NOISE LEVELS

Quiet is conducive to psychological and physiological well-being for humans. Just as excessive noise has been documented to negatively affect human health and welfare, elevated noise levels from human activities can disrupt the normal behavior patterns of wildlife, interfering with migration, breeding, hunting, and predator avoidance.

5.9.1 Water Reclamation Facility

In the area surrounding the Project Area, noise is primarily created by residential traffic. One source of noise is the railroad that runs along the northern boundary of the project site. Noise levels are highest near traffic corridors (especially near US 1), with lower noise levels near residential areas. Typical residential noises on the Project site include lawn mowers, leaf blowers, dogs barking, and roosters crowing. This noise is generally concentrated during daylight hours.

5.9.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

In the area surrounding the Beaver Creek PS and along the transmission lines, noise is primarily created by residential traffic. Noise levels are highest near traffic corridors (especially near US 1), with lower noise levels near residential areas. Typical

residential noises on the Project site include lawn mowers, leaf blowers, dogs barking, and roosters crowing. Noise is also generated by agricultural equipment working in fields surrounding the Beaver Creek PS site and along the transmission lines. This noise is generally concentrated during daylight hours.

5.10 SURFACE WATER AND GROUNDWATER RESOURCES

5.10.1 Surface Water

5.10.1.1 Water Reclamation Facility

The WRF Project site is located within the Upper Cape Fear River Basin in DWQ subbasin 030607 and in USGS Hydrologic Unit Code 03030004020010. The Wake County hydrography layer (Wake County, 2005) displays 9 intermittent and 3 perennial channels within the project site. Stream type determination was based on the assumption that perennial streams were associated with hydric soils. The channels encompass approximately 16,935 feett of stream draining to White Oak Creek, a tributary of Harris Lake. A USACE wetland delineation identified 12 streams within the WRF project site, 10 of those streams were determined to be perennial and 2 intermittent. All streams on the Project Site are classified as Class C. (Note: DWQ has not classified many of the unnamed tributaries; stream classifications of unnamed tributaries are equivalent to the stream to which they drain). Class C waters are suitable for aquatic life support, secondary recreation, and fishing. There are no water quality monitoring sites on the project site or on White Oak Creek (Figure 5-7).

5.10.1.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The Beaver Creek PS Project site is located within the Upper Cape Fear River Basin in DWQ subbasin 030605 and in USGS Hydrologic Unit Code 03030002060. Surface water drains to four small unnamed tributaries within the pump station project area, which eventually drains to Beaver Creek and subsequently to Jordan Lake. The streams on the Beaver Creek PS project site are classified as Class WS-IV NSW. WS-IV waters are waters that can be used for potable water supply and are protected to Class C uses; there are no categorical restrictions on discharges. Nutrient sensitive waters (NSW) have site specific restrictions designed to reduce nutrient inputs from point and non-point sources. There are no water quality monitoring sites on the project site or on tributaries that receive surface water from the project site.

The West Cary PS to Beaver Creek PS transmission lines are located within the Jordan Lake watershed of the Upper Cape Fear River Basin in DWQ subbasin 030605 and in USGS Hydrologic Unit Code 03030002060160 and 03030002060150. This

transmission line crosses approximately 20 perennial streams and 3 intermittent streams (the determination of stream type was based on the relation of a stream with hydric soils—if the two were paired it was considered a perennial stream (data source: CGIA, 2004). All streams along the transmission line are classified as Class WS-IV NSW.

The Beaver Creek PS to WRF transmission lines are located within the Upper Cape Fear River Basin in DWQ subbasin 030605 and in USGS Hydrologic Unit Codes 03030002060150 and 03030004020010. This transmission line crosses approximately 5 perennial streams and 4 intermittent streams. The majority of streams along the transmission line are classified as Class WS-IV NSW and a small percentage are classified as Class C.

The pipeline route corridor and the line from the corridor to the Discharge Structure and Diffuser on the Cape Fear River below Buckhorn Dam are located within the Upper Cape Fear River Basin in DWQ subbasin 030605 and in USGS Hydrologic Unit Code 03030004020010, 03030004020020, and 03030002060170. Within the pipeline corridor there are 2 perennial streams and 6 intermittent streams, of which all are headwater streams due to the location of this corridor along the watershed divide between the Jordan Lake and the Harris Lake watersheds. This transmission line from the pipeline corridor crosses approximately 5 intermittent streams and 1 perennial stream. The streams along the transmission lines are classified as WS-IV and Class C.

5.10.1.3 Cape Fear River

The Cape Fear River between Buckhorn Dam and Lock and Dam 3 is classified as WS-IV and WS-V to protect drinking water and industrial water supplies.

Chemical

Both the Middle Cape Fear River Basin Association (MCFRBA) and DWQ monitor water quality along the Cape Fear River mainstem in the study area (Figure 5-7). The MCFRBA monitors at seven locations:

- US 401 at Lillington
- NC 217 at Erwin
- Fayetteville's water supply intake
- I-95 in Fayetteville
- Riverside Landing
- Dupont's water supply intake
- Lock and Dam 3

The MCFRBA also monitors water quality upstream of Buckhorn Dam and 7 additional mainstem sites between L&D #3 and L&D #1. DWQ also monitors at US 401, NC 217 and maintains an ambient station at NC 24 in Fayetteville. Data presented in DWQ's Basinwide Assessment Report (DWQ, 2004) indicate that the DO standard is maintained in this section of river. The main water quality concern in this section of the river is elevated chlorophyll *a* behind the Lock and Dam (L&D) structure. Figure 5-8 reproduces DO data summarized in DWQ's report (data through 2003).

Since the data presented in the Basinwide Assessment Report did not include data from 2004 and 2005, the MCFRBA were reviewed for updated dissolved oxygen information. Table 5-8 summarizes the DO data at Lillington and L&D #3.

TABLE 5-8
MCFRBA DO Data Summaries at Lillington and L&D #3

Description	Lillington	L&D #3
No. DO samples in 2004	17	15
Minimum DO in 2004	3.7	5.7
Maximum DO in 2004	12.7	9.6
No. DO Samples < 4 mg/l in 2004	1	0
Percent DO Samples < 4 mg/l in 2004	6	0
No. DO samples in 2005	17	17
Minimum DO in 2005	6.1	5.1
Mean DO in 2005	12	12.4
No. DO Samples < 4 mg/l in 2005	0	0
Percent DO Samples < 4 mg/l in 2005	0	0

From MCFRBA Annual Report (January 2004-December 2004) and 2005 data provided by MCFRBA.

The MCFRBA data were evaluated for the Basinwide plan (data through 2003). These data indicate that the chlorophyll *a* standard of 40 µg/l is exceeded in 27 percent of the samples above L&D #3. Since the water quality standard is a year-round standard and data was only collected between April and October, the data were also analyzed to determine whether they would indicate impairment with year-round sampling. Assuming all winter months had values less than the standard, results still indicated impairment for the area above L&D #3, with 14 percent of the data points exceeding the standard. If the extreme drought conditions in 2002 were not included, results indicated impairment with 11 percent of the data points exceeding the standard.

Research funded by the MCFRBA and conducted by Dr. Steve Whalen of UNC-Chapel Hill and his graduate students in 2000 and 2003 focused on algal productivity behind the L&D structures and nutrient limitation. Key findings of the 2000 study were:

- Short retention time behind the Locks and Dams under medium to high river flows is very limiting to productivity.
- During 2000 when flows averaged 63 percent of the long-term average flow, little stratification occurred and the system was vertically well-mixed, as expected in a river.
- No exceedances of the chlorophyll *a* standard were observed during 2000.
- TN was generally more limiting than TP (both are important).

Key findings of the 2003 research are:

- Significant nutrient reductions showed no significant reduction in productivity.
- Irradiance (light) is limiting factor in system.
- Increased water clarity (more light) and increased water column stability (that begins to occur under low flow and longer retention time behind the lock and dam) substantially increases phytoplankton growth

Observations of limited data available from the MCFRBA regarding physical parameter variations with depth in the river during the extremely low flows in 2002 indicate that elevated levels of chlorophyll *a* behind L&D #3 occurred when there appeared to be slight stratification of the system. This was evidenced by reduced temperature with depth and super-saturated DO conditions only at the surface. The MCFRBA chlorophyll *a* samples were collected as surface grabs and not as depth-integrated composite samples (to twice the secchi depth) as directed in DWQ's Draft Intensive Survey Standard Operating Procedures (DWQ, 2003). The super-saturated conditions at the surface would tend to indicate that under stagnant conditions, phytoplankton accumulated near the surface.

To determine if depth-integrated sampling (in accordance with DWQ procedures) over the top 2 to 3 meters of the water column would result in significantly lower chlorophyll *a* results, the MCFRBA began following DWQ procedures in November 2004. Data collected to date using the depth-integrated sampling indicates that the chlorophyll *a* standard is protected even under drought conditions. Twelve chlorophyll a samples were collected at L&D #3 in 2005 and are summarized in Table 5-9:

TABLE 5-9
Summary of Chlorophyll A Data Collected At L&D #3 In 2005 by MCFRBA

Description	L&D #3
No. Chlorophyll *a* samples	15
Minimum Chlorophyll *a* in 2005	5.7
Maximum Chlorophyll *a* in 2005	9.6
No. Chl *a* Samples > 40 ug/l in 2005	0
Percent Chl *a* Samples > 40 ug/l in 2005	0

From MCFRBA 2005 data provided by MCFRBA.

Benthic

DWQ monitored the benthic community on the Cape Fear River at Person Street in Fayetteville in 1993 and 1998. In 1993, the river was assigned a Good-Fair rating. DWQ did not rate the river at this site based on the 1998 monitoring since it appears that flow conditions appear to be structuring the benthic community rather than water quality.

Fish

No fish community sampling was performed on the Cape Fear River. Further information on the fish community sampling is provided in Section 5.13.

5.10.1.4 303 (d) Listed Streams

Section 303(d) of the Clean Water Act requires that states develop a list of waters not meeting water quality standards or which have impaired uses. The state must prioritize these waterbodies and prepare a management strategy or TMDL. No streams within the Project Area are listed (DENR, 2004b). However, the state is considering portions of the Cape Fear River downstream of the confluence of the Haw and Deep Rivers as "impaired" because of nutrient enrichment problems behind Buckhorn Dam and L&D No. 3 as part of the Cape Fear River Basinwide Water Quality Management Plan development process in 2005. This may result in the inclusion of some river segments on the 2006 303(d) list.

5.10.2 Groundwater

Since groundwater information is available for larger scale areas, the existing environment for the WRF, force mains, pump stations, and gravity sewer lines have been combined. The Project Area is within the Triassic Basin of the Piedmont region of North Carolina and is characterized by a thin regolith layer which limits groundwater storage capacity. As a result, well yields tend to be low (around 5 to 25 gallons per minute [gpm]). Within the western portion of Wake County where the Project Area is located, approximately 6 percent of precipitation reaches the groundwater for recharge,

contributing approximately 35 to 55 percent of stream baseflow during normal precipitation years. Groundwater within the Planning Area is generally free of contaminants and is used as a source of drinking water by individuals and community well systems (Wake County, 2003).

Surrounding the Project Area, groundwater wells are used for water supply, both with individual and community wells (Wake County, 2003). In most cases, groundwater is safe to use as a drinking water source and is void of contaminants.

5.11 FOREST RESOURCES

5.11.1 Water Reclamation Facility

Large areas of forested land are present in the Project Area. The most dominant forest type is Southern Yellow Pine encompassing 143 acres (Table 5-4). Southern Yellow Pine includes Loblolly (*Pinus taeda*), Slash (*P. elliottii*) and Longleaf (*P. palustris*) pines. Other forested communities dominated by pine species include Piedmont Xeric Pine Forests and Piedmont Dry-Mesic Pine Forests. Drier xeric habitats tend to be dominated by Virginia pine (*P. virginiana*) or Shortleaf pine (*P. echinata*) while others are dominated by Loblolly pine, especially those that were recently cleared.

Hardwood and mixed forest communities include Piedmont Dry-Mesic Oak and Hardwood Forests, Xeric Pine-Hardwood Forests, Piedmont Dry Mesic Oak-Pine Forests, and Successional Deciduous Forests. In most communities dominated by oak species, White oak is the most common (*Q. alba*). Habitats with drier conditions are dominated by Southern red (*Q. alcate*), Post (*Q. stella*), and Chestnut oaks (*Q. prinus*). Sweetgum (*Liquidambar styraciflua*) and Yellow poplar (*Liriodendron tulipifera*) are the other main canopy species. Sites with basic soils may also provide habitat for Eastern red cedar (*Juniperus virginiana*).

Along stream corridors, Piedmont Mixed Bottomland Hardwood Forest communities are present. Tag alders (*Alnus serrulata*) and Button bush (*Cephalanthus occidentalis*) often dominate the shrub communities. Typical bottomland forest canopy species include Sweetgum, Red maple, Sycamore (*Plantanus occidentalis*) and Black gum (*Nyssa sylvatica*), which are all tolerant of wetter soils. Wide areas of bottomland forest are present along the tributaries to Jordan Lake. Narrower areas of bottomland forest are present along the other tributaries to Harris Lake.

During the wetland delineation at the WRF site, several species of vegetation were observed and are listed in table 5-10.

TABLE 5-10
Tree and shrub species observed at the WRF site

Species	Stratum	Wetland Indicator status
Quercus alba	T	FACU
Liriodendron tulipifera	T	FAC
Quercus falcata	T	FACU-
Pinus taeda	T/S	FAC
Acer rubrum	T/S	FAC
Liquidambar styraciflua	T/S	FAC+
Quercus nigra	T/S	FAC
Ligustrum sinense	S	FAC
Ilex opaca ait	S	FAC-
Chamaecyaparis thyoides	S	OBL

Stratum: T = Tree; S = Shrub

Wetland Indicator Status: OBL = Obligate Wetland; FAC = Facultative; FACU = Facultative Upland;

5.11.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The majority of the land along the transmission lines is southern yellow pine as shown in Table 5-5. The Beaver Creek PS had 58 percent of its land as managed herbaceous cover and 25 percent of the project site as bottomland hardwoods.

Forest Productivity

A measure of forest productivity is the site index based on soil type. The site index is a measure of the average height (in feet) that an unmanaged even aged stand grown for 50 years will attain. The soils type (from Table 5-2) and site index are listed in Tables 5-11 and 5-12 for all areas. The first tree species listed in the Common Trees column is the indicator species for that soil.

TABLE 5-11
Forest Productivity for Soil Types on the WRF Project Site

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	66.3	28.2%	Loblolly pine Shortleaf pine Yellow-poplar	87 66 97	Loblolly pine, Shortleaf pine
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	59.1	25.1%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	44.1	18.7%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	16.7	7.1%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Wo	Wehadkee and Bibb	16	6.8%	Loblolly pine Sweetgum Water oak	90 90 90	Eastern cottonwood, Sweetgum, Yellow-popular
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	11.9	5.1%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
WsE	White Store sandy loam, 10 to 20 percent slopes	8.8	3.8%	Loblolly pine	75	Loblolly pine
Wy	Worsham sandy loam	7.8	3.3%	Loblolly pine Yellow-popular	89 93	Loblolly pine, Yellow-popular
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	3.5	1.5%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
WvD3	White Store clay loam, 2 to 15 percent slopes, severely eroded	1.1	0.5%	Loblolly pine	81	Loblolly pine
		235.3	100%			

Source: NCCGIA 2004 and USDA 2006

TABLE 5-12A
Forest Productivity for Soil Types along Transmission Line from West Cary PS to Beaver Creek Pump Station

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	9.7	20.20%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Wo	Wehadkee and Bibb	8.1	16.90%	Loblolly pine Sweetgum Water oak	90 90 90	Eastern cottonwood, Sweetgum,Yellow-popular
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	7.3	15.20%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Au	Augusta fine sandy loam	7.1	14.80%	American sycamore Loblolly pine Southern red oak Sweetgum White oak	90 90 80 90 80	American sycamore, Cherrybark oak, Loblolly pine, Sweetgum, Yellow-popular
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	3	6.30%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
AfA	Altavista fine sandy loam, 0 to 4 percent slopes	2.7	5.60%	Loblolly pine Sweetgum Yellow-popular	96 97 97	American sycamore, Cherrybark oak, Green ash, Loblolly pine, Water oak, Willow oak, Yellow-popular
Wn	Wehadke silt loam	2.2	4.60%	Green ash Sweetgum Water oak Willow oak Yellow-popular	89 97 94 94 100	Green ash, Sweetgum, Yellow-popular
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	1.3	2.70%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	1.2	2.50%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Wy	Worsham sandy loam	1.1	2.30%	Loblolly pine Yellow-popular	89 93	Loblolly pine, Yellow-popular
Cm	Chewacla	1	2.10%	Loblolly pine Sweetgum Water oak Yellow-popular	95 97 80 95	American sycamore, Loblolly pine, Sweetgum, Yellow-popular
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	0.9	1.90%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine

TABLE 5-12A
Forest Productivity for Soil Types along Transmission Line from West Cary PS to Beaver Creek Pump Station

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
MfC2	Myodan sandy loam, 6 to 10 percent slopes, eroded	0.6	1.30%	Loblolly pine Shortleaf pine Virginia pine White oak	88 63 74 74	Loblolly pine
CrC	Creedmoor sandy loam, 6 to 10 percent slopes	0.5	1.00%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
GrC2	Granville sandy loam, 6 to 10 percent slopes, eroded	0.4	0.80%	Loblolly pine	79	Loblolly pine
WsE	White Store sandy loam, 10 to 20 percent slopes	0.3	0.60%	Loblolly pine	75	Loblolly pine
GrC	Granville sandy loam, 6 to 10 percent slopes	0.2	0.40%	Loblolly pine	79	Loblolly pine
Bu	Buncombe	0.1	0.20%	Loblolly pine	90	America sycamore, Yellow-popular
MfE	Myodan sandy loam, 15 to 25 percent slopes	0.1	0.20%	Loblolly pine Shortleaf pine Virginia pine White oak	88 63 74 74	Loblolly pine, Shortleaf pine
Cp	Congaree silt loam	>0.1	>0.1%	American sycamore Cherrybark oak Loblolly pine Scarlet oak Sweetgum Willow oak Yellow-popular	89 107 90 100 100 95 107	America sycamore, Black walnut, Cherrybark oak, Eastern cottonwood, Loblolly pine, Sweetgum, Yellow-popular
Cn	Colfax Sandy Loam	>0.1	>0.1%	Loblolly pine Red maple Shortleaf pine Sweetgum Yellow-popular	80 65 70 80 80	Loblolly pine, Virginia pine
Ro	Roanoke fine sandy loam	>0.1	>0.1%	Sweetgum Water oak Willow oak	90 67 67	Cherrybark oak, Green ash, Southern red oak, Sweetgum, Water oak, Willow oak, Yellow-popular
		48	100%			

Source: NCCGIA 2004 and USDA 2006

TABLE 5-12B
Forest Productivity for Soil Types at Beaver Creek Pump Station

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	9.2	29.20%	Loblolly pine Shortleaf pine Yellow-poplar	87 66 97	Loblolly pine, Shortleaf pine
GrC2	Granville sandy loam, 6 to 10 percent slopes, eroded	8.4	26.70%	Loblolly pine	79	Loblolly pine
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	5.3	16.80%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Au	Augusta fine sandy loam	4.4	14.00%	American sycamore Loblolly pine Southern red oak Sweetgum White oak	90 90 80 90 80	American sycamore, Cherrybark oak, Loblolly pine, Sweetgum, Yellow-popular
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	3.9	12.40%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
w	Water	0.3	1.00%	-	-	-
		31.5	100%			

Source: NCCGIA 2004 and USDA 2006

TABLE 5-12C
Forest Productivity for Soil Types along Transmission Line from Beaver Creek Pump Station to WRF

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	9	30.70%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	5.3	18.10%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	3.6	12.30%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	3.5	11.90%	Loblolly pine Shortleaf pine Yellow-poplar	87 66 97	Loblolly pine, Shortleaf pine
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	2.3	7.80%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	1.3	4.40%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
Wy	Worsham sandy loam	1.3	4.40%	Loblolly pine Yellow-popular	89 93	Loblolly pine, Yellow-popular
Au	Augusta fine sandy loam	1.2	4.10%	American sycamore Loblolly pine Southern red oak Sweetgum White oak	90 90 80 90 80	American sycamore, Cherrybark oak, Loblolly pine, Sweetgum, Yellow-popular
Wn	Wehadke silt loam	0.7	2.40%	Green ash Sweetgum Water oak Willow oak Yellow-popular	89 97 94 94 100	Green ash, Sweetgum, Yellow-popular
WsE	White Store sandy loam, 10 to 20 percent slopes	0.4	1.40%	Loblolly pine	75	Loblolly pine
Cm	Chewacla	0.4	1.40%	Loblolly pine Sweetgum Water oak Yellow-popular	95 97 80 95	American sycamore, Loblolly pine, Sweetgum, Yellow-popular
Wo	Wehadkee and Bibb	0.1	0.30%	Loblolly pine Sweetgum Water oak	90 90 90	Eastern cottonwood, Sweetgum, Yellow-popular
WvD3	White Store clay loam, 2 to 15 percent slopes, severely eroded	>0.1	>0.3%	Loblolly pine	81	Loblolly pine
GrB	Granville sandy loam, 2 to 6 percent slopes	>0.1	>0.3%	Loblolly pine	79	Loblolly pine
		29.3	100%			

Source: NCCGIA 2004 and USDA 2006

TABLE 5-12D

Forest Productivity for Soil Types along Transmission Line from WRF through Pipeline Route Corridor (NOTE: This data does not include soils for the portions of the line in Chatham County; digital soils data is not available.)

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	42.6	30.60%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
CrC2	Creedmoor sandy loam, 6 to 10 percent slopes, eroded	30.7	22.10%	Loblolly pine Shortleaf pine Yellow-poplar	87 66 97	Loblolly pine, Shortleaf pine
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	11.1	8.00%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
WsB	White Store sandy loam, 2 to 6 percent slopes	4.9	3.50%	Loblolly pine	75	Loblolly pine
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	4.3	3.10%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
Wo	Wehadkee and Bibb	4.2	3.00%	Loblolly pine Sweetgum Water oak	90 90 90	Eastern cottonwood, Sweetgum,Yellow-popular
CrB	Creedmoor sandy loam, 2 to 6 percent slopes	2.6	1.90%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
w	Water	2	1.40%	-	-	-
Wy	Worsham sandy loam	1.7	1.20%	Loblolly pine Yellow-popular	89 93	Loblolly pine, Yellow-popular
WsE	White Store sandy loam, 10 to 20 percent slopes	0.9	0.70%	Loblolly pine	75	Loblolly pine
CrE	Creedmoor sandy loam, 10 to 20 percent slopes	0.7	0.50%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
GrB2	Granville sandy loam, 2 to 6 percent slopes, eroded	0.35	0.30%	Loblolly pine	79	Loblolly pine
	Chatham County soils	33	23.70%			
		139.1	100%			

Source: NCCGIA 2004 and USDA 2006

TABLE 5-12E
Forest Productivity for Soil Types along Transmission Line from Pipeline Route Corridor to Discharge Structure (NOTE: This data does not include soils for the portions of the line in Chatham County; digital soils data is not available.)

Soil Type	Description	Acres	Percent of site	Forest Land Productivity		
				Common Trees	Site Index	Trees to Manage
WsC2	White Store sandy loam, 6 to 10 percent slopes, eroded	2.3	3.70%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
WsB2	White Store sandy loam, 2 to 6 percent slopes, eroded	2.2	3.60%	Loblolly pine	75	Eastern red cedar, Loblolly pine, Virginia pine
WsB	White Store sandy loam, 2 to 6 percent slopes	1.2	1.90%	Loblolly pine	75	Loblolly pine
Wy	Worsham sandy loam	0.1	0.20%	Loblolly pine Yellow-popular	89 93	Loblolly pine, Yellow-popular
CrB2	Creedmoor sandy loam, 2 to 6 percent slopes, eroded	0.1	0.20%	Loblolly pine Shortleaf pine Yellow-popular	87 66 97	Loblolly pine, Shortleaf pine
	Chatham County soils	56	90.4			
		62	100%			

Source: NCCGIA 2004 and USDA 2006

5.12 SHELLFISH OR FISH AND THEIR HABITATS

5.12.1 Water Reclamation Facility

The majority of the streams occurring within the Project area are headwater tributaries of White Oak Creek which typically have very low flows during summer months. Low flow conditions can impact the aquatic life, limiting abundance and diversity. Fish species present within these water bodies are typical of the Piedmont region and probably include species such as sunfish, creek chub, and brim.

North Carolina Wildlife Resources Commission (NCWRC) biologists conduct regular surveys for large mouth bass and crappie in Harris Lake, and Progress Energy monitors this system as well. The Progress Energy data have been requested and have not been received. Data received from NCWRC on fish catch statistics for Harris Lake (catch per unit effort) indicates that numbers of largemouth bass have generally increased since 1995. The proportional stock density of largemouth bass has stayed relatively constant for fish sized greater than 300 mm, and for fish sized greater than 400 mm the proportional stock density data show a general trend of increasing since 1992.

5.12.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The majority of the streams along the transmission lines are headwater streams which drain to Jordan Lake, Harris Lake or the Cape Fear River. Fish species present within these water bodies are typical of the Piedmont region and probably include species such as sunfish, creek chub, and brim.

As outlined in the WRF description above, WRC biologists conduct regular surveys for large mouth bass and crappie in Harris Lake, and the data were summarized above. In addition, WRC monitors the fishery in B. Jordan Lake. The 2004 progress report titled Mechanisms of Reservoir Fish Community Dynamics examined the populations of largemouth bass, crappie, and striped bass in B.E. Jordan Reservoir. The report found that the reservoir supports a quality largemouth bass fishery with mean relative weight values near the optimum level for all size classes. The crappie fishery is also in good health and mean relative weight was the second highest value observed since 1999. The striped bass population showed a mix of age classes and above average growth rate. In addition, the condition of fish was above average indicating a healthy fishery.

5.12.3 Cape Fear River

The NC DWQ does not maintain any sampling stations for Fish on the Cape Fear River between Buckhorn Dam and Lock and Dam 3 (Figure 5-7). However there are fish sampling stations located in tributaries that flow into this stretch of the Cape Fear River. These stations were sampled in 1998 and 2003, and only two tributaries were able to be scored using NC IBI for fish: Hector Creek and Avents Creek. In 1998 both the Avents and Hector Creek stations scored a Good rating using NC IBI (48 and 46 respectively). In 2003 Avents Creek scored a Good-Fair (44) and Hector Creek scored an Excellent (56).

The Avents creek sampling site is upstream of a waterfall that acts as a barrier to fish movement between the creek and the Cape Fear River except under high flow conditions. Therefore this sampling station may not represent the fish community in the Cape Fear River. The Hector Creek site does not have a barrier to fish movement and therefore fish could move between this tributary and the Cape Fear River. Near Fayetteville, DWQ has performed fish community sampling in the Cross Creek watershed. This watershed is very urbanized and its streams have lost many of the sandhills characteristics (NC DWQ Basins Report 2004). The most dominant fish species in the Cross Creek watershed in 1998 and 2003 was the Red Breast Sunfish. Table 5-13 lists the 10 most abundant fish species collected during sampling in 1994-2003 for the tributaries of

the Cape Fear between Buckhorn dam and Lock and Dam 3. This list likely omits large fish species, such as catfish, which would only be found in the main stem of the Cape Fear.

TABLE 5-13
Fish Species Found in Greatest Abundance on Cape Fear River Tributaries

Species	Common Name	Total (98-03)
Nocomis leptocephalus	Bluehead Chub (carps)	776
Lepomis macrochirus	Bluegill (sunfish)	722
Lepomis auritus	Redbreast Sunfish	567
Luxilus albeolus	White Shiner	533
Etheostoma olmstedi	Tessellated Darter	305
Notropis altipinnis	Highfin Shiner	301
Aphredoderus sayanus	Prate Perch	130
Semotilus atromaculatus	Creek chub	120
Noturus insignis	Noturus insignis	119
Anguilla rostrata	American Eel	109

NCWRC performed a creel survey that indicated most recreational fishing on the Cape Fear River occurs between Buckhorn Dam and Erwin and the fishing effort is directed primarily towards catfish. Also striped bass hybrids seem to have migrated downstream from Jordan Lake (where they were stocked up until 2002) and are also taken in this section of the Cape Fear.

5.13 WILDLIFE AND NATURAL VEGETATION

5.13.1 Water Reclamation Facility

The Project site area exhibits a sporadically located, heterogeneous mix of plant community types. These plant communities were generated through natural succession and were most likely manipulated by past and existing land uses. Examples of manipulation include but are not limited to land clearing for agricultural purposes, selective timber harvesting, and fire. The Project site area and the immediate vicinity contain dirt trails and roads, ditches, wetlands areas, ponds, stream channels, gas rights-of-way, and forested riparian areas. This interspersion of habitat types has a direct correlation to the wildlife population dynamics and the species diversity. Wildlife habitat located in the vicinity includes upland mixed pine/hardwood forest, mixed hardwood forest, forested wetlands and riparian areas, impoundments, and stream channels.

Upland communities are home to Virginia opossum, raccoon, eastern cottontail, gray squirrel, red and gray foxes, and white-tailed deer, as well as the eastern mole and several species of shrews and mice. While no surveys for amphibians and reptiles were

performed, abundant habitat for these types of animals was observed during the wetlands delineation. Frogs, turtles and water snakes probably inhabit wetlands and the perimeter of ponds and streams in the project area.

Bird life in the Project Area is likely typical of the Carolina Piedmont. Species likely using the area are: cardinals, American robins, Carolina chickadees, bluebirds, sparrows, warblers, rufous-sided towhees. These and other songbirds make their homes in the backyard habitats and forests of the area. Hawks, such as the red-tailed hawk, owls and vultures are predator and scavenger species known to inhabit the area. The open waters of the large pond on the Project site probably attract a variety of waterfowl, including migratory species during certain seasons. Geese and domesticated ducks were seen using the pond during the wetlands delineation.

5.13.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

The areas at the pump station and along the transmission lines exhibit a sporadically located, heterogeneous mix of plant community types similar to the WRF site. Species common to the WRF site will likely be common along the transmission lines, the pump station site, and discharge structure.

5.13.3 Threatened and Endangered Species

Specific regulations exist at the state and federal levels to protect endangered and threatened species and their habitats from impacts due to public or private projects and land-disturbing activities. The primary law that protects sensitive wildlife species is the Federal Endangered Species Act (ESA) of 1973.

Information obtained from the North Carolina Natural Heritage Program's (NHP) Natural Heritage Element Occurrence (NHEO) and Significant Natural Heritage Area (SNHA) databases, as supplied by CGIA (updated Spring 2004), were analyzed to identify locations of rare and endangered species populations and occurrences of exemplary or unique natural ecosystems (terrestrial and aquatic) and special wildlife habitats in the Project Area. No natural heritage elements are known to exist on the project site. Figure 5-4 illustrates the distribution of natural heritage element occurrences within a 5 mile radius of the project area.

Table 5-14 contains a list of all state or federal threatened or endangered species known to occur within a 5 mile radius of the project area. Four species are federally listed and of these, one is listed as Federal Species of Concern (FSC). Two species

are listed as Endangered while one, the Bald eagle (*Haliaeetus leucocephalus*), is listed as Threatened. The four federally listed species are described in the following paragraphs. Also a full list of State- and Federally-listed species in Wake and Chatham Counties is provided in Appendix H.

The Bald eagle (*Haliaeetus leucocephalus*) is considered Threatened, but is proposed for delisting because of recent recovery of the species (USFWS, 2003). The bald eagle is a large raptor and is recognized by the characteristic white head of an adult. Nests are often constructed near water and can measure up to 6 feet across. Nests are reused by the same pair year after year. Bald eagles primarily feed on fish, but can consume other small animals including frogs, smaller birds, and turtles. The recovery of this species is largely due to the banning of harmful pesticides including DDT. No bald eagles or habitat are present within the Project Area.

TABLE 5-14
Rare Species within a 5-mile Radius of the WRF Site

SNHEO ID	Type	Scientific Name	Common Name	State Status	Federal Status	Aquatic*	Wetland
112955	Amphibian	*Hemidactylium scutatum*	Four-toed salamander	SC		N	Y
153039	Bird	*Aimophila aestivalis*	Bachman's sparrow	SC	FSC	N	N
561361	Bird	*Haliaeetus leucocephalus*	Bald eagle	T	T (PD)	N	Y
4511617	Bird	*Picoides borealis*	Red-cockaded woodpecker**	E	E	N	N
12324	Insect	*Lithophane lemmeri*	Lemmer's pinion	SR		N	N
551714	Mammal	*Sciurus niger*	Eastern fox squirrel	SR		N	N
752095	Vascular Plant	*Hexastylis lewisii*	Lewis's heartleaf	SR-L		N	N
531893	Vascular Plant	*Rhus michauxii*	Michaux's sumac	E-SC	E	N	N
61799	Vascular Plant	*Tradescantia virginiana*	Virginia spiderwort	SR-P		N	N

T = Threatened
E = Endangered
SC = Species of Concern
FSC = Federal Species of Concern
SR = State Rare

*Aquatic and wetland categories refer to a species' preferred habitat.
**Records of the Red-cockaded woodpecker are only historic and this species has not been observed in Wake County for more than 20 years

Michaux's sumac (*Rhus michaux*) is an upland terrestrial vascular plant and is also considered Endangered. This shrub grows to between 1 and 3 feet and flowers between June and July. Most plants are unisexual, which may partly explain the plant's rarity. Reproductive capacity is low. Typical habitat includes sandy or rocky open woods with basic soils. Repeated disturbance is necessary to provide open areas for

this plant to be successful. Remaining populations are found along maintained roadway rights-of-way and areas managed with frequent fires. Threats to remaining populations include habitat loss due to development and fire suppression. Michaux's sumac, according to the most recent version of the NHEO database provided by NHP, is present near the Shearon Harris Longleaf Pine Forest SNHA. Michaux's sumac was not observed during visits to the WRF project site, but suitable habitat could exist along the gas ROW along the northern boundary of the site. Suitable habitat could exist in upland areas of the BCPS site.

Bachman's Sparrow (*Aimophila aestivalis*) occurs in the Piedmont, Sandhills and Coastal Plain. Its habitat includes open longleaf pine forests and old fields [during the breeding season only] (NC NHP). The reason for decline of this species is not obvious, but it is assumed that habitat loss is a primary factor (Mitchell,1998). Habitat requirements for Bachman's sparrow can be met by abandoned farmlands and mature longleaf pine forests. The ground foraging strategy of this species also requires open grassy areas. Fire suppression and other practices that allow woody shrubs to predominate are also contributors to the loss of habitat (Mitchell, 1998). Currently Bachman's sparrow is a Federal species of concern and of special concern to the state of North Carolina. Potential habitat could exist on the WRF site in old fields that have not been maintained.

Historic Red-cockaded woodpecker (*Picoides borealis*) records were present near the Project area along US 1. According to NCNHP, these populations have been extirpated. No current populations of Red-cockaded woodpecker are present in the area surrounding the project areas. No habitat was observed on the WRF and Beaver Creek PS sites during site visits.

The following two species are federal species of concern and warrant a description. They are not known to currently occur in areas within 5 miles of the proposed wastewater infrastructure but they have been historically found in the Cape Fear River.

Carolina redhorse (*Moxostoma sp*.) is a sister species to the Golden redhorse (*M. erythrurum*) (Starnes pers. comm.) and is known only from the Carolinas. It is a fairly large species and adults prefer large rivers with pools eight to twelve feet deep. Spawning habitats include clean gravel shoals, and spawning occurs in May (Starnes, 2005). Populations of the Carolina redhorse are thought to have declined recently due to loss of spawning habitat and increased sedimentation in deep pools. The Carolina redhorse is listed as a Federal species of concern and is listed as a significantly rare

species in NC. Currently the best known populations are in the Deep River. Recently a large sampling effort to look for this large river species was undertaken by personnel of the North Carolina Museum of Natural Sciences and the Carolina redhorse was not found in the Cape Fear River, and it is thought that the Carolina redhorse has become extirpated in this river (Starnes, 2005).

Cape Fear Shiner (*Notropis mekistocholas*) is a small fish that rarely exceeds 2 inches in length and feeds exclusively on vegetation. Its range consists of areas in Cape Fear drainages in 5 counties of North Carolina. It is usually associated with gravel and cobble substrates, inhabiting slow pools, riffles and slow runs (NC FWS web site). Reasons for this species decline include deterioration in water quality and changes in hydrology due to flow regulation. This species is not known to exist in the portion of the Cape Fear River from Buckhorn Dam to Lock and Dam 3, and is thought to be extirpated in this area (Rabon, 2004).

5.14 INTRODUCTION OF TOXIC SUBSTANCES

5.14.1 Water Reclamation Facility

In the immediate area surrounding the Project area there are few potential sources of toxic substances. These potential sources include: agricultural-related substances such as fertilizers, herbicides, and pesticides. Other common toxic substances are employed in the construction of homes and commercial buildings such as glues, solvents, and paints. Typical household hazardous wastes include oils, cleaners, solvents, paints, herbicides, and fertilizers. Permit requiring activities within Wake County near the Project area (within 5 miles) include water discharge permits, hazardous waste operations, and industrial activities. In addition to these potential sources of toxic substances there are regulated activities in the Town of Apex, including drycleaners, industrial processes, and water treatment facilities (USEPA 2006).

5.14.2 Force Main, Gravity Sewers, Pump Stations, Effluent Transmission Mains, and Discharge Structure

In the areas surrounding the transmission lines, pump stations, and discharge structures, several potential sources of toxic substances exist. These include water discharge permits, hazardous waste operations, and industrial activities, however the transmission lines are not adjacent to any of these activities (USEPA, 2006). Additionally the raw wastewater transmission line is located approximately 1 mile from a hazardous waste site (CGIA, 2004).

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